DISSERTATION ON

A STUDY ON CLINICAL PRESENTATION AND OUTCOME OF SCORPION STING IN CHILDREN

Dissertation Submitted to

THE TAMILNADU DR. M.G.R. MEDICAL UNIVERSITY

In partial fulfillment of the regulations

for the award of the degree of

M.D IN PAEDIATRIC MEDICINE

BRANCH VII

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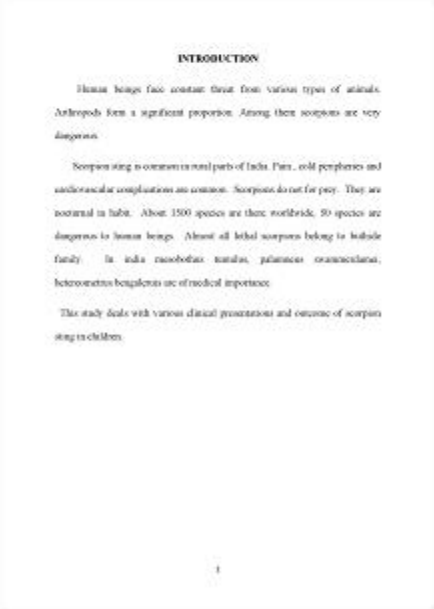
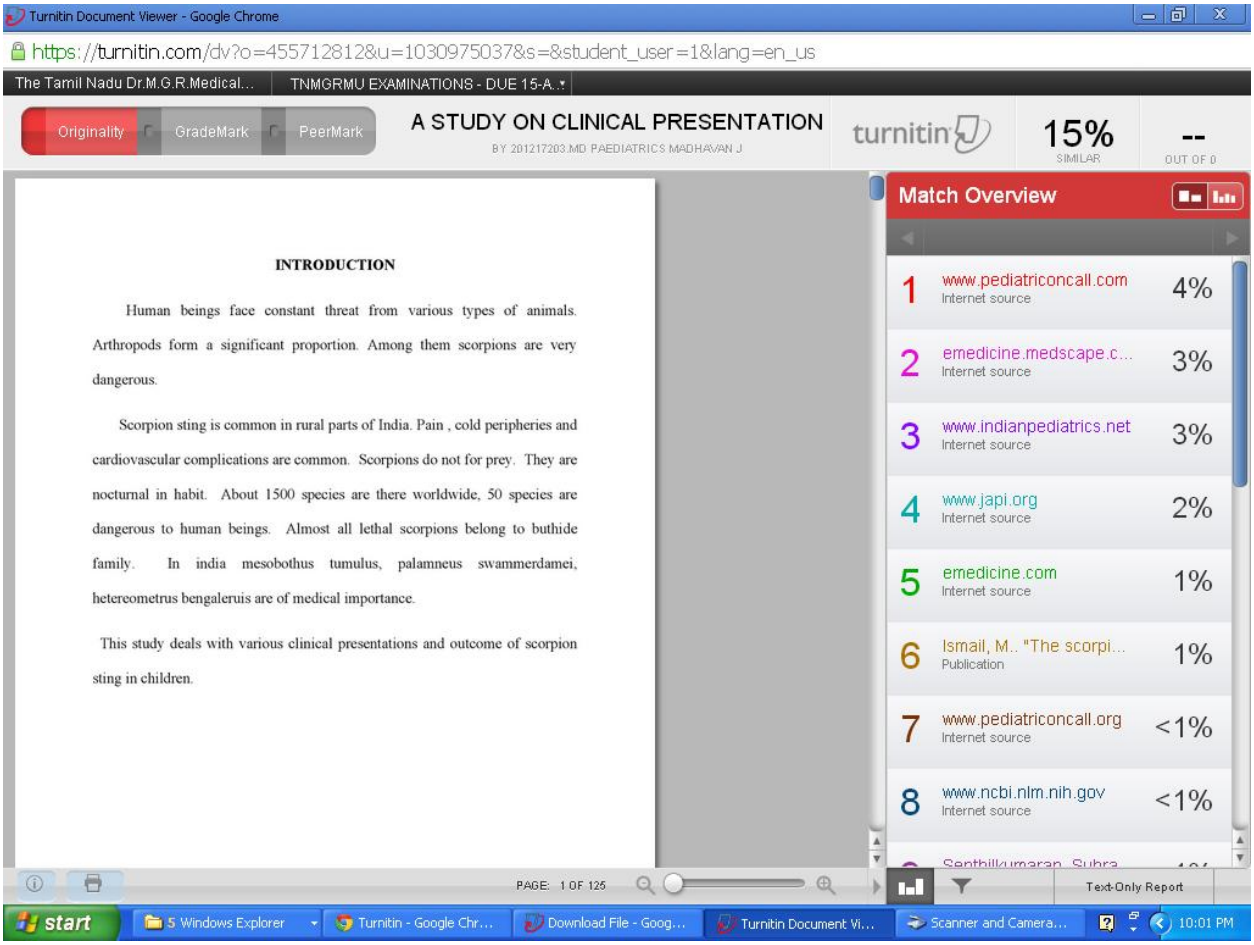


INTRODUCTION

Human beings face constant threat from various types of animals. Arthropods form a significant proportion. Among them scorpions are very dangerous.

Scorpion sting is commonest in rural parts of India. Pain, cold peripheries and cardiovascular complications are common. Scorpions do not for prey. They are nocturnal in habit. About 1500 species are there worldwide. 50 species are dangerous to human beings. Almost all lethal scorpions belong to buthide family. In india mesobuthus tamulus, palamneus swammerdami, heterometrus bengalensis are of medical importance.

This study deals with various clinical presentations and outcome of scorpion sting in children.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ABSTRACT

Background and objectives :

Scorpion sting is a frequent, life threatening medical emergency in children. They constitute a significant public health problem in many underdeveloped counties, including india. This study was to done to study to the clinical presentation and outcome of scorpion sting in children.

Methodology :

This is an observational study of 141 cases of scorpion sting, admitted to government raja mirasdhar hospital, Thanjavur.

The clinical Presentation and outcome were studied

Results :

Scorpion sting is a common, pediatric emergency in our area. Rural male children, from lower socioeconomic groups, aged between 1-3 years (35%) and 7-12 years(34%) were most commonly affected. Pain at the site of sting (89%) and cold peripheries (77%) were the most common presenting symptom and sign respectively. Myocarditis (9%) and pulmonary edema (4%), were also frequently encountered. Complications were more common in younger children and in cases who received the first dose of prazosin late i.e. After 6 hours). One case succumbed to the death (0.7%), but majority of cases (99%), recovered, without sequelae.

conclusion :

Scorpion stings is a serious, potentially fatal emergency in our area. Peripheral circulatory circulatory is common. Cardiovascular manifestations are life threatening. Scorpion stings constitute a "occupational hazard" for children employed as agricultural labourers. Administration of prazosin, as early as possible, is probably, the single most effective intervention in preventing complications and mortality.

Key words :

scorpion sting, prazosin, occupational hazard.

INTRODUCTION

Human beings face constant threat from various types of animals. Arthropods form a significant proportion. Among them scorpions are very dangerous.

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This study deals with various clinical presentations and outcome of scorpion sting in children.

OBJECTIVE

To study the clinical presentation and of scorpion sting in children.

To study the outcome of scorpion sting in children.

REVIEW OF LITERATURE

Scorpion sting envenomation is one of the most common acute life threatening emergencies managed in paediatric units of many rural and semi-urban regions of India. Scorpion stings are rather common in India due to its tropical climate and also because the majority of population sustains on agriculture especially in semi urban and rural regions.

Scorpion sting is an acute life threatening, time-limiting medical emergency amongst the rural children of India. Older children are frequently employed as agricultural labourers, thus exposing them to field related scorpion sting. Scorpion sting, just like snake bites are an occupational hazard especially for the rural population.

Many cases of scorpion sting envenomation go unreported and the true incidence is difficult to fathom. Case fatality rates vary widely among different regions from 3-22% and over the years with improvement in management protocols there has been a dramatic decline in mortality.

Scorpions are an ancient species whose fossil records date up to 430 million years ago .Around 1500 species of scorpions have been described worldwide. Scorpions have evolved to a minimal extent and hence are also described as “living fossils”. Scorpions are reputed to be one of the first land animals to inhabit the earth.

There are approximately 86 species of scorpions found in India, out of which Mesobuthus tamulus and Palamneus swammerdami are commonly encountered. In many tropical and subtropical regions of the world scorpions are the most venomous creatures next to snakes.

Mesobuthus tamulus is one of the most lethal scorpion species and inhabit in regions such as Western Maharashtra, Andhra Pradesh, Saurashtra, Pondicherry and Tamilnadu.

CULTURAL SYMBOLISM

Scorpions have played a part in multitudes of mythological literature. Many symbolisms have been attributed to this elegant arachnid.

- In Egyptian mythology the scorpion symbolizes a trickster who caused the death of the God king Osiris.

Fig.1: Egyptian mythology the scorpion symbolizes a trickster

- Scorpion represents the constellation Scorpio which is seen in low summer skies

Fig.2

❖ In Greek mythology a battle ensued between Scorpio and the hunter Orion , resulting in Scorpio stinging Orion on the foot.

Fig.3

❖ In Hyderabad ,the Falaknuma palace is laid in the shape of a scorpion with two pincers spreading out as wings of the building

Fig.4: The Falaknuma palace

Fig.5

- Scorpion was placed on the crown of the Egyptian goddess Selket who was believed to order the scorpion to slay the wicked and protect the innocent.

Fig.6 : Scorpion on the crown of the Egyptian goddess

- Scorpions in Tibetan mythology are called “digpa ratsa” meaning negative or harmful action.

Fig. 7

- In regions of Southern Karnataka, a scorpion goddess Chellama is worshipped.

CLASSIFICATION OF SCORPIONS

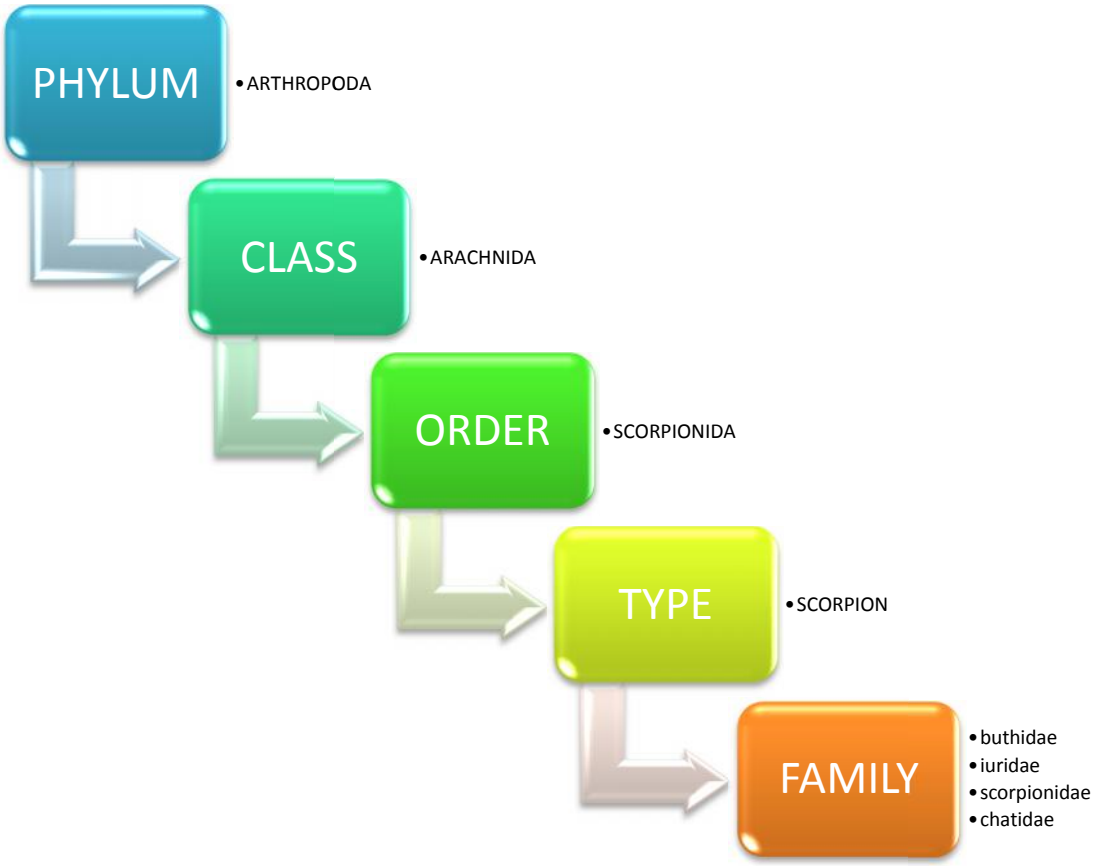


Fig. 8: Classification Of Scorpions

Scorpions belong to the class Arachnidan of phylum Arthropod, they are considered similar to aquatic species proscorpius. Many morphologic characters between scorpions and tics, mites are common .Scorpions are eight legged arthropods in the class Arachnid, they are viviparous and cannibalistic.

HABITAT

- Underground burrows
- Under logs or debris
- Paddy husks
- Sugarcane fields
- Coconut plantations
- Banana plantations

Scorpion have been able to survive in heat, drought, freezing conditions for weeks, desert conditions and starvation for months and total immersion of water for days. This remarkable power of adaption makes their survival independent of ecological condition and gives the species an unbroken continuity in adverse climatic conditions.

During the day time scorpions take shelter under bark of trees, dry fire wood or cow dung, in the piles of bricks, paddy husk, beddings, loose tiles of hut, in the shoes left empty overnight, pockets of trouser sand shirt, carving, crevices of windows and doors.

Scorpions are commonly found in regions with red soil. Scorpions are primarily nocturnal creatures. In daytime they are unable to tolerate heat and

retreat into underground burrows. Scorpions are active during summer season and in winter they retreat into hibernation.

Scorpions are predominantly reclusive creatures with a penchant for lying immobile. Upon sensing a disturbance or threat the scorpion assumes a defensive posture by raising up its stinger. Scorpions live in a world of sensory deprivation as they don’t have specialized visual, auditory or olfactory receptors.

Scorpions have a tendency to localize prey using mechanoreceptors present in their legs which sense vibrations. Scorpions are found to be most active in the summer season especially between 6.00 am -12.00 noon and second peak from 6.00 pm to 12 midnight.

MORPHOLOGIC FEATURES

Scorpions exhibit diversity base on size, colour, distribution and other morphological features.

- **Shape**

Elongated, narrow and dorsoventrally flattened

- **Size**

1.3 to 20 cm. The largest scorpion is Pandinus imperator which is found in tropical countries and measures around 20 cm in length

- **Colour**

  - blackish dorsal aspect
  - light coloured ventral aspect
  - Mesobuthus – reddish yellow
  - Palamneus – blackish

PARTS

- Cephalothoraxes
- Abdomen
- Tail

The scorpion has two pairs of pedipalps which protrude from the cephalothoraxes and give rise to chelae or pincers which are used to catch and hold the prey. The tail is six segmented and extends from the posterior abdomen

and terminates in the venom apparatus or telsonwith a stinger at the tip. Venom production occurs in two glands located in the telson and is injected through the stinger into the victim by contraction of gland muscles.

Scorpions are viviparous creatures. A mother scorpion gives birth to about 6-90 young scorpions at a time. There are approximately 1500 species of scorpion throughout the world.

Most prominent scorpion species are as follows:

- Centuroidessculpturatus- southern USA, central America
- Androctonusparabuthus – Africa
- Tityus species – South America
- Leirus – Africa and Middle East
- Mesobuthus species- Asia
- Palamneus species – Asia

Fig.9 : Mesobuthus species

Fig.10: Palamneus species

The most common species prevalent in south India are mesobuthus tamulus and Palamneus swammerdami whereas Palamneus bengalensis is found in the north.

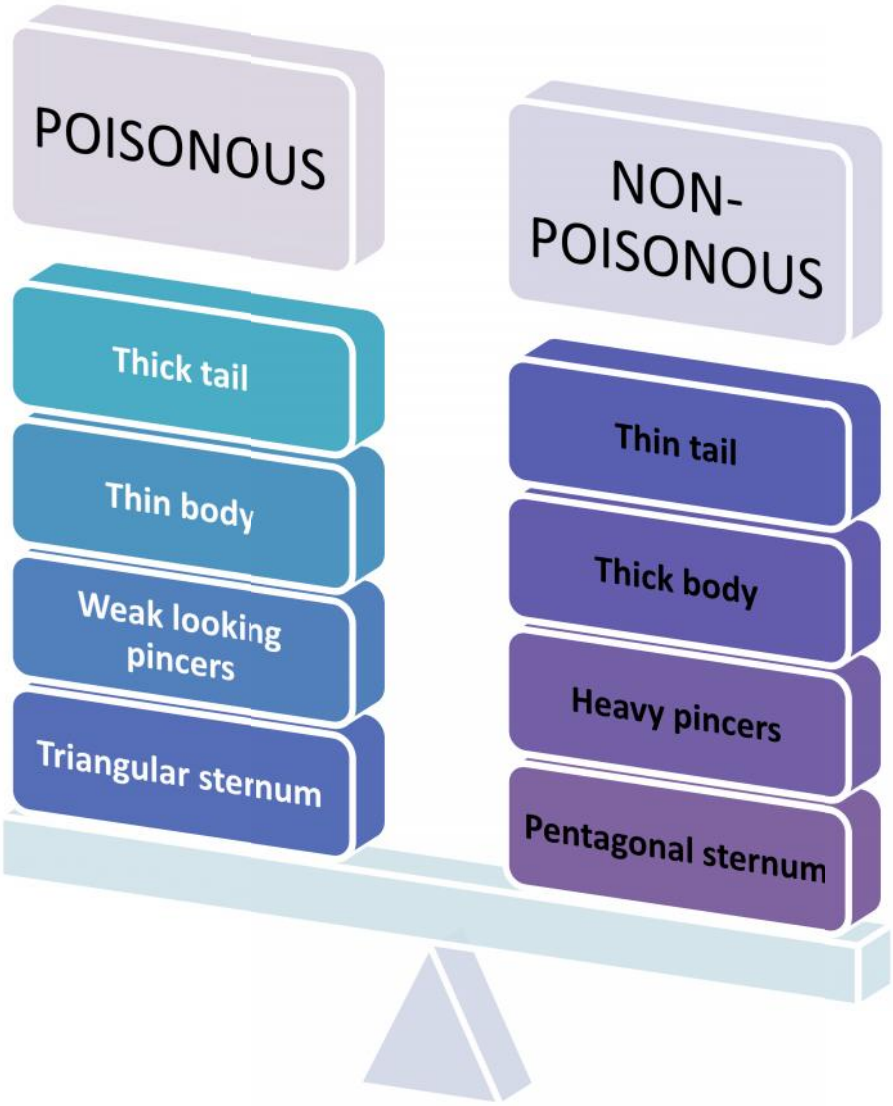


Fig.11: Difference between Poisonous and non poisonous scorpion

- Heaviest scorpion: hadogenes troglodytes -32 kg
- Smallest scorpion :typhlocactus mitchelli 8.5 -9.0 mm
- Longest living scorpion: urodacus yashenkoi- 24 years

SCORPION VENOM

Scorpion venom is a water soluble compound which is an antigenic and heterogeneous mixture. The venom components are as follows:

- Neurotoxin
- Cardiotoxin
- Nephrotoxin
- Haemolytic toxin
- Phosphodiesterase
- Phospholipase
- Hyaluronidase
- Glycosaminoglycans
- Histamine
- Serotonin
- Tryptophan
- Cytokine releasers

The scorpion venom is secreted from a pair of special glands situated near the pseudo abdomen and delivered through the sting.

Physical properties

Scorpion venom is a viscid thermostable fluid, faintly acidic in reaction with a specific gravity of 1092. The venom smells like vinegar hence the name venogrome.Neurotoxin is the most potent toxin present in scorpion venom. The

neurotoxin is heat stable, has low molecular weight and is responsible for causing cell impairment on nerves, muscles and heart by altering ion channel permeability.

- Long chain polypeptide neurotoxin causes stabilization of voltage dependent sodium channels in the open position leading to continuous prolonged repetitive firing of somatic sympathetic and parasympathetic neurons.
- Short polypeptide neurotoxin blocks potassium channels

The binding of neurotoxin to host is reversible but different neurotoxins have different affinities. The stability of neurotoxin is due to disulphide bridges that fold the neurotoxin into three dimensional compact structures thus making it resistant to pH and temperature changes. However reagents which can break the disulphide bridges can inactivate this toxin. The antigen city of the toxin is dependent on length and number of exposed regions that are sticking out of three dimensional structures. The understanding of biochemical properties and the clinical effects of the venom have important implications in designing appropriate therapeutic interventions.

The scorpion toxic peptides are broadly classified as alpha and beta toxins. Alpha toxins block voltage dependent inactivation of sodium channels and beta toxin shift voltage dependent activation of these channels to a more negative membrane potential. Voltage gated sodium channels are integral membrane proteins that permit selective permeation of sodium channels across

biological membranes thus causing generation of action potentials in excitable cells. Beta toxin with short chain polypeptide which is the main constituent in centuroids species blocks the potassium channels.

The stimulation of sodium channels and the inhibition of potassium channels both lead to intense persistent stimulation of autonomic nerves predominantly alpha receptors leading to massive release of neurotransmitters from adrenal medulla stimulating parasympathetic and sympathetic nerve endings thus initiating autonomic storm.

Effects on various systems

- **Cardiovascular system**

Cardiovascular manifestations are mediated via stimulation of both parts of autonomic nervous with a predominance of sympathetic stimulation and release of tissues and medullar catecholamine's. Typical effects are initial bradycardia followed by tachycardia and also aninitial short period of hypotension due to cholinergic effect and a secondary but relatively prolonged hypertension.

- **Myocardium**

Pathogenesis of catecholamine induced myocardial necrosis is multi factorial. Catecholamine induced vasospasm and increased myocardial metabolism leading to hypoxia which is supported by the finding that more severe lesions are located near cardiac apex. The effect of alpha receptor

stimulation leads to suppression of insulin secretion, hyperglycemias ,hyperaemia, free fatty acid and free radical accumulation which are injurious to the myocardium Excess of noradrenalin also induces changes in permeability of the sarcolemmal ,membrane leading to increased calcium influx . This calcium influx has a direct toxic effect on the myocardium giving rise to cellular necrosis.

- **Hypertension**

Hypertension is one of the commonest cardiovascular manifestations of scorpion sting envenomation. This is due to massive outpouring of catecholamine's from the adrenal medulla and also from postganglionic neurons.

- **Hypotension Mechanisms**
- Early cholinergic stimulation
- B2 vasodilator effect
- Increased quantities of potent vasodilators like kinin, prostaglandins
- Catecholamine depletion
- Cardiogenic shock
- **Cardiac arrhythmias**

They can occur due to either autonomic dysfunction or electrolyte imbalance in particular hyperkalemia. Other electrolyte abnormalities which are implicated are hyponatremia, hypocalcemia and hypomagnesaemia.

Scorpion venom increases the membrane permeability to sodium by stabilizing voltage sensitive sodium channels in open state and this effect is associated with calcium entry and blockage of calcium dependent potassium channels disturbing transmembrame potassium gradient resulting in either absolute or relative hyperkalemia. Other factors like decreased insulinsecretion, increased catecholamine also play a role in hyperkalemia

- **Central Nervous System**

Cerebrovascular manifestations are uncommon in scorpion stings in the Indian subcontinent but neurological manifestation are well documented in stings due to mesobuthus tamulus. The causes of neurological manifestations are multifactorial

The neurotoxin in the venom acts on the respiratory centre, vasomotor centre, nerve terminals and on end plate of both striated and non-striatedmuscles. Theneurotoxin may produce convulsions by inducing cortical irritation. Stroke may occur due to thrombosis or haemorrhage or following intense cerebral vasospasm induced by autonomic storm. Further haematological changes induced by the effect of the venom may cause DIC and multiple cerebral infarctions

Scorpion envenomation leads to a high arterial blood pressure by a massive catecholamine discharge. When arterial blood pressure is excessive it leads to cerebral damage, oedema and ischemia explaining the observed neurological signs. This hypothesis was advanced in some studies which

reported anatomical abnormality in the central nervous system secondary to severe scorpion envenomation such as haemorrhagic or ischaemic infarction.

Hence it was thought that CNS manifestations are primarily due to peripheral effect of catecholamine and CNS dysfunction is the result and not the cause of many manifestations of scorpion envenomation. In some cases direct effect of toxin on neurons could contribute to seizures and encephalopathy. However hemiplegia and other neurological lesions have been attributed to fibrin deposition resulting from DIC.

- **Neuromuscular junction**

Scorpion venom has both excitatory and inhibitory effect on neuromuscular junction. The venom of centuroidessculpturatus acts at the presynaptic terminals of the neuromuscular junction causing depolarization.The depolarization causes increases calcium permeability at presynaptic terminals provoking entry of calcium ions and acetylcholine release resulting in muscle twitching and fasciculations. Further scorpion venom may produce paralytic or myasthenia like effect in neuromuscular junction due to persistent depolarization or due to depletion of acetyl choline from presynaptic terminals.

- **Respiratory system**

There are various factors responsible for respiratory manifestations and pulmonary oedema. Scorpion sing leading to life threatening pulmonary oedema had been well documented in India. A direct toxin induced increase in

pulmonary vessel permeability is thought to be a fundamental pathology in acute pulmonary oedema. Pulmonaryoedema has also been attributed to be secondary to the catecholamine induced effects of hypoxia and intracellular calcium accumulation on myocardium leading to decrease in left ventricular systolic dysfunction which also contributes to the development of pulmonary oedema.

The venom also causes medullary respiratory depression**.** Experimental myocarditis induced by scorpion venom in animals have demonstrated erythrocyte Na K ATPase activity inhibition and increased red cell fragility which is probably secondary to inhibition by FFA.

- **Renal system**

Pathology may be due to

- Decreased renal plasma flow
- Hypovolemia
- Afferent arteriolar constriction
- Toxin induced acute tubular necrosis
- Immune complex glomerulonephritis
- Rhabdomyolysis-renal failure may result from venom induced excessive motor activity
- As a complication of DIC

- **Other systems**

  - Local inflammation is unusual in Indian red scorpion envenomation but severe skin reactions characterised by erythema, oedemalymphangitis and severe necrosis is well known in Iran in stings caused by buthuscosmobuthus and hemiscorpus species probably secondary to polypeptide variations of different venoms.
  - The mechanism of pancreatitis has been thought to be due to conversion of trypsinogen to trypsin by scorpion venom which increases permeability of pancreatic blood vessels leading to edematous and hemorrhagicpancreatitis .The other mechanism is perhaps indirect stimulation of release of acetyl choline from pancreatic nerves.
  - Scorpion venom and SIRS

    SIRS is triggered by envenomation following sting by tityusserrulatus. Increased levels of IL 6, IL1a,IFN 1 and induction of iNOS was demonstrated in these cases. The levels of cytokines correlate with the severity of envenomation.

CLINICAL FEATURES

The signs of envenomation are determined by the scorpion species, venom composition and the victim's physiological reaction to the venom. The signs occur within a few minutes after the sting and usually progress to a

maximum severity within hours. The signs last for 24-72 hours and do not have an apparent sequence.

Thus predicting the evolution of signs over time is difficult. Furthermore a false recovery followed by a total relapse is common. In India, Israel,Brazil and Mexico cardiac manifestations are more common. In Iran tissue necrosis and haemolysis predominate. Neurological manifestations are prominent in USA and South Africa

The toxicity variation and duration of the symptoms depends on the following factors.

Factors related to the scorpion

- Species
- Size of the scorpion
- Number of stings
- Quantity of venom injected
- Depth of the sting
- Composition of the venom

Factors related to the victim

- Age
- Health
- Weight of the victim relative to the amount of the venom

- Site of envenomation- closer proximity of the sting to the head and torso results in faster venom absorption into central circulation and quicker onset of symptoms
- Presence of comorbidities
- Timing of initiation of treatment
- Changes in body temperature

Cardiovascular manifestations dominate the clinical picture in India especially so with stings by mesobuthus tamulus (Indian red scorpion) severe local reactions, acute pancreatitis and CNS manifestations are encountered less frequently in India.

LOCAL EFFECTS

- **Pain**

This is the commonest clinical feature. It is usually a sharp burning pain at the site of sting which gradually spreads to involve whole limb within few minutes to hours. Pain usually lasts for 12-24 hours but occasionally up to two days. This is followed by a sensation of paraesthesia which feels like an electric current which may persist for weeksand is the last symptom to resolve before the victim recovers. Tap test is administered by tapping at the site. A positive test result is when the paraesthesia worsens with the tap because the site is hypersensitive to touch and temperature. In fact wearing clothing over the area and sudden temperature changes exacerbate the symptoms.

Other local reaction

- Local oedema erythematic and wheal
- Local lymphangitis
- Necrosis and ulceration

- **ANS signs**

Mesobuthus tamulus envenomation evokes a potent autonomic response characterized by transient cholinergic manifestations later merging imperceptibly wit features of adrenergic stimulation. Early cholinergic over

activity, hypotension, hypertension, myocardial dysfunction, pulmonary oedema and shock is a spectrum of one process namely autonomic storm.

There may be predominantly sympathetic signs, parasympathetic signs or combination of signs.

SYMPATHETIC

- Tachycardia
- Tachypnea
- Hyperthermia
- Hypertension
- Arrhythmia
- Hyperkinetic pulmonary oedema
- Diaphoresis
- Piloerection
- Restlessness and apprehension
- Carpopedal spasm

PARASYMPATHETIC

- Bradycardia
- Hypotension
- SLUDGE- Salivation, Lacrimation, Urination ,Diarrhoea ,Emesis
- Bronchoconstriction, bronchial secretion
- Loss of bowel and bladder control

- Miosis
- Priapism
- Dysphagia
- Rhinorrhoea

Hypotension and bradycardia is encountered initially within 1-2 hours of sting due to cholinergic stimulation. Hypotension and tachycardia between 4-48 hours due to severe left ventricular dysfunction and hypotension along with good volume pulse and warm extremities later in the recovery stage. Myocardialdys function, pulmonary oedema and cardiogenic shock may occur later in the course and are considered part of the autonomic storm and not as separate syndromes.

- **Cardiovascular system**

Cardiac dysfunction characterized by myocarditis left ventricular failure and cardiogenic shock may complicate the clinical picture. Tachycardia is the commonest finding usually seen within first 4 hours and may persist for 24-72 hours, bradycardia can also be observed. Hypertension is secondary to catecholamine and renin stimulation which is seen as early as 4 minutes after envenomation and lasts for 4-8 hours. It may be high enough to produce hypertensive encephalopathy, cardiac failure and pulmonary oedema. Cardiovascular collapse occurs secondary to biventricular dysfunction due to myocarditis and profuse loss of fluids along with catecholamine induced cardiac

ischemia. However some case series from south India report peripheral circulatory failure and hypotension initially with myocarditis observed only during follow up.

❖ **Respiratory system**

- Cough
- Breathlessness
- Wheeze
- Tachypnoea
- Hyperventilation
- Pulmonary oedema
- Respiratory failure

Pulmonary oedema is a life threatening complication following scorpion sting by mesobuthus tamulus species. It develops within 30 min to 3 hours following a sting. Pulmonary oedema may be due to both cardiogenic and non-cardiogenic causes. Patient presents with cough dyspnoea pink frothy sputum and cyanosis. Respiratory failure may occur due to medullary respiratory depression or secondary to diaphragm paralysis.

❖ **Central nervous system**

Patient may have CNS manifestations in the form of altered sensorium, irritability, restlessness, confusion and delirium. Patient may also demonstrate

abnormal behaviour. Thalamus induced systemic paraesthesia is usually seen within 3-4 hours of sting. Patient may develop venom induced cerebral thrombosis resulting in stroke which occurs after 24-48 hours following thesting. other less significant manifestation are rigid spastic muscles of limbs and torso, involuntary muscle spasm, twitching, clonus and contracture, alternating episthotonus and opisthotonus along with increased tendon reflexes. Patients sometimes present with seizure

- **Priapism**

Bawaskar has noted occurrence of this clinical symptom in as many as 10 percent of his patients. He noticed subsequent development of cardiac manifestations in all these patients who had priapism hence he considered priapism as one of the premonitory signs of cardiac complications.Priapism is more common in scorpion sting due to buthus tamulus

- **Gastrointestinal signs**

Mainly due to cholinergic stimulation Patient may present with-

- Excess salivation
- Dysphagia
- Nausea and vomiting
- Increased gastric acid output leading to gastric ulcers
- Abdominal distension

- Acute pancreatitis

Acute painless pancreatitis detected by elevated serum amylase levels is also known to occur. Cases of haemorrhagic pancreatitis and pancreatic pseudocysts have been described.

❖ **Hematologic manifestations**

There may be catecholamine induced platelet aggregation resulting in thrombotic episodes and bleeding manifestations due to toxin induced DIC.

❖ **Renal manifestations**

Scorpion sting can produce a syndrome of oliguria, anuria and hematuria associated with puffiness of face. Acute renal failure has also been reported and could be due to toxin induced acute tubular necrosis immune complex deposition DIC or rhabdomyolysis.

DIFFERENTIAL DIAGNOSIS

The diagnosis of scorpion sting is usually straight forward based on a history of sting and the clinical symptoms and signs. The confusion regarding diagnosis can occur in the following instances-

- ❖ Infants and younger children who cannot give history of scorpion sting
- ❖ When victim is stung in darkness
- ❖ When the victim is stung when he is asleep
- ❖ When the patient lapses into coma after the sting

It is wise to consider a diagnosis of scorpion sting in all cases of unexplained shock with profuse sweating, myocarditis or pulmonary oedema in areas heavily infested with scorpions.

INVESTIGATIONS

The laboratory findings in a case of scorpion sting has very limited role to play. No laboratory evaluation is uniformly helpful in the diagnosis and management of scorpion envenomation the important investigations are ECG, echocardiography, cardiac enzymes, serum electrolytes and blood glucose.

- ❖ **Blood analysis**
    - ESR is likely to be increased in significant number of cases.
    - Leucocyte count-polymorphonuclear leucocytosis was noted in few cases of scorpion sting but not found to be pathologically significant

❖ **Urine analysis**

- Urine colour may be smoky cola coloured in nephritis
- Proteinuria and hematuria rarely noted with nephritis
- Glycosuria has been documented in scorpion stings
- Vanylmandelic acid levels may be raised in urine and reflects increased metabolism of catecholamines

❖ **Blood sugar**

Hyperglycaemia had been well documented following scorpion stings. Causes for hyperglycaemia include –

- Catecholamine surge
- Reduced insulin secretion
- Pancreatitis with beta cell destruction

❖ **Serum electrolytes**

- Hyponatremia and hypokalemia had been noted due to diaphoresis, vomiting and diarrhoea
- Hyperkalemia is a frequently observed finding in severe envenomations and could contribute to development of arrhythmias
- Hypocalcemia has also been noted following scorpion stings

❖ **Serum enzymes**

Levels of SGOT, SGPT may be increased due to venom induced liver cell damage and myocarditis.

Serum amylase level may be elevated and unless proves otherwise is taken as a feature of pancreatitis.

❖ **Renal functions**

Renal functions may be altered with elevation of blood urea and serum creatinine levels in cases with acute renal failure following scorpion sting

❖ **Electrocardiography**

ECG is an important investigation which helps in diagnosis of fatal conduction disturbance, ischemia and myocarditis.ECG changes may last for as long as 10 days before normalization. Various ECG changes are-

- **Cardiac rhythm disturbance**-
  - Sinus tachycardia
  - SVT
  - Bradycardia
  - Sinus arrhythmia
  - Pulsusalternans
- **Conduction disturbances –**
  - Various degrees of heart block including partial and complete heart block
  - AV dissociation with accelerated junctional rhythm

- Prolongation of QT interval

- **Ischaemic pattern**
  - Hyper acute T Wave
  - Inversion of T Wave

- **Early myocardial infarction like pattern**-
  - Broad tall peaked t wave measuring up to 20 mm in height
  - ST depression in precordial leads
  - ST segment changes (elevation and depression) in the limb leads
  - Appearance of Q waves.

Prognostic significance of ECG

Those with ECG findings suggestive of early myocardial infarction like pattern are found to have higher incidence of congestive cardiac failure and peripheral vascular collapse. Patients with ECG of low voltage complexes throughout the recording and left anterior hemi block indicate poor prognosis.

❖ **Chest radiography**

Radiographic changes are noted in pulmonary vascular congestion-straight non-branching lines in the upper lung fields that run diagonally towards the hilum and inter lobular septal oedema.

❖ **Echocardiography**

Echocardiography is done to detect left ventricular systolic dysfunction. The following findings may be noted

- Left ventricular dilatation
- Regional wall motion abnormalities
- Decreased left ventricular ejection fraction

TREATMENT OF SCORPION STING

Scorpion sting is a common problem worldwide and often, children are victims of fatalstings. The clinical features following envenomation by the Indian red scorpion(Mesobuthus tamulus) are predominantly due to the effect of autonomic stimulation on the cardiovascular system. The steps involved in managing these children are outlined below.

Step1

Confirmation of the sting is done by history given by the eye witness or by observing the killed scorpion.

Step 2

Differentiation of a benign sting frompotentially fatal envenomation. Severe local pain, local sweating and mildly raised blood pressureand no autonomic storm, indicate a non-poisonous sting.

Step 3

Identification of autonomic storm which is evident soon after the sting (minutes to 4 hours).Vomiting, profuse sweating, cold extremities, excessive salivation, rope like saliva, priapismin males and paraesthesia especially around the mouth are features of autonomic storm.

Cardiovascular signs include hypertensionor hypotension, cardiac arrhythmias, sinusbradycardia or tachycardia, S3 gallop, transient

non-sustained ventricular tachycardia, transient systolic murmur and left ventricular failure. Oculogyric phenomenon, proptosis, puffyface and abdominal colic are seen in those withhypertension.

It is observed that in children with scorpion sting profuse sweating may last for 7-20 hours, priapism / mydriasis for 6-18 hours, hypersalivation for 2-12 hours and tachycardia alone for 12-18 hours. Anuria, pulmonary oedema, hypotension, convulsions and shock are late manifestations. Persistent tachypnea is an earlysign of pulmonary oedema in children.

The cause of hypotension in these childrencan be due to any one of the following factors.

- **Early short lasting**: Hypovolemia (due to profuse sweating and vomiting), peripheral cholinergic or central vagal
- **Delayed long lasting**: Myocardial failure ordecreased vascular resistance.
- **Asymptomatic**(72- 96 hours): Exhaustedcatecholamine stores.

Central nervous manifestations are infrequent. Intra cerebral haemorrhage is invariably fatal. Late presentations include, hemiplegia and choreoathetosis which may appear as late as 10 days after recovery from acute symptoms.

MANAGEMENT

Close monitoring of the following parameters is an essential part of management- cold peripheries, pulses, respiratory rate, heart rate, blood pressure and S3, S4 gallop. ECG and chestx-ray are needed in any child with significant features of systemic envenomation. Common ECG changes encountered include, premature ventricular contraction, bigeminy, tented T wave, acute myocardial infarction like pattern, STdepression, injury to conducting system i.e. left anterior hemi block, left or right bundle branchblock and QT >500 msec.

For non-poisonous sting:

Pain relief is done by cooling of the affected part or local anaesthetic agent; oral paracetamol and oral diazepam maybe used.

Poisonous sting:

Hospitalize for frequent monitoring and stabilisation of hemodynamics. Key clinical features determining the need for management in a High Dependency Unit or Intensive Care Unit are severe tachycardia, palmoplantar sweating, S3 gallop, hypotension, shock, pulmonary oedema and ECG changes. Correction of dehydration is important. Vomiting, salivation and sweating contribute to dehydration. Confused agitated child can be given fluids by NG tube. Restriction of fluid due to fear of pulmonary oedema is a common mistake. Hypovolemia correction is a priority. Oralrehydration or intravenous crystalloids to be given as dictated by the clinical picture.

Prazosin, a post synaptic α adrenergic receptor blocking agent, should be given in a dose of 30μg/kg in children, which should be repeated three hourly until there are signs of clinical improvement in tissue perfusion such as –

- ❖ Warming of extremities
- ❖ Increase in urine output
- ❖ Appearance of severe local pain at the site of sting which was absent or tolerable on arrival
- ❖ Disappearance of par aesthesia
- ❖ Reduction or improvement in heart rate
- ❖ Improvement of signs of pulmonary oedema
- ❖ Reduction in hypertension
- ❖ Improvement in blood pressurein case of hypotension without hypovolemia,
- ❖ Reduction or disappearance of murmur
- ❖ Earliest and most important sign- the child feels better or decreased restlessness in a small child.

The drug has 1000 times more affinity towards the activated alpha-1 receptors. The dose is to be repeated six hourly till extremities become dry and warm. If the initial dose has been vomited (one should see the vomit carefully), it should be repeated. In a confused, agitated, non-cooperativechild, prazosin should be administered by nasogastric tube.

Prazosin is lifesaving drug hence attending doctor himself should administer the drug to the hospitalized patient and it should be clinically confirmed by noting the signs and symptoms that drug is absorbed in circulation and started acting. First dose phenomenon (fall in blood pressure following an initial dose of prazosin)is due to postural fall in blood pressure and israre. This can be prevented by avoiding lifting the child and not allowing getting up from bed. Postural hypotension should be treated by placing in head low position and intravenous fluids. After prazosin therapy, the following should be closely monitored to identify good response: Dilated peripheral veins, good volume pulse, warm extremities, reappearance of pain, adequate urine output, no par aesthesia

Pulmonary oedema is a life threatening time limiting emergency, often fatal and needs rapid intervention. Patient should be in propped up position if there is no hypotension. Intravenous aminophylline 5mg/kg diluted in dextrose is givenas a slow bolus to counter the associated bronchospasm. If available is osorbide buccal spray is useful or powder of nitroglycerine should be rubbed on gum and intravenous furosemide should be given to reduce the preload and pulmonary congestion.

In cases of massive pulmonary oedema (blood stained froth fromnostrils and mouth), intravenous sodium nitroprusside (SNP) drip 0.5 microgram per kg per minute is started and dose raised continuously according to patient’s response and blood pressure upto 8µg/kg/min. Blood pressure should be closely

monitored and maintained at 80-90 mm mg of systolic blood pressure. SNP has to be prepared from fresh powder every four hours; the bottle and saline set should be protected from light. At times a severe case may require 15-36 hours of SNP drip to clear pulmonary oedema. Patient should be given oral or inject able cynacobalamine to avoid cyanide toxicity whenever SNP is given for a long time. Before starting SNP, IV furosemideis given to avoid sudden fall of intra-ocular pressure and ocular bleed due to SNP drip.

IV nitro-glycerine can be used in a dose of 0.5-5microgram per kg per minute if SNP is not available. In case of shock or hypotension, early administration of dobutamine 5-15 microgram per kg per minute along with SNP drip may be lifesaving. In children, after 20-24 hours of sting, marked tachycardia (130 and above), warm extremities, pulmonary oedema or air hunger respond to IV dobutamine drip, which may be required for 48 hours.

Presence of pulmonary oedema has no relationship to intravascular volume. One should not assume such patients to be fluid overloaded. Diuretics may be harmful. Cardiac output canbe improved with dobutamine. Morphine is contraindicated. In occasional victims with myocardial dysfunction, ventricular premature contraction or R on T phenomenon and ventricular tachycardia respond to intravenous lidocaine.

Atropine, steroids, antihistamines, beta blockers, calcium channel blockers, excessive diuretics, adrenaline and narcotics should be avoided. They do more harm than good in scorpion envenomation. Newer reports of carnitine for myocardial dysfunction in scorpion sting has been reported.

Indian experience is limited in the use of scorpion antivenin, though benefits are reported from USA, Mexico, Saudi Arabia and Brazil (Centruroides species). Trials in Tunisia(RCT) found no useful role for antivenin in severe envenomation.

Treatment of scorpion sting was in its primitive stages till recently which primarily constituted application of various herbal medicines like tobacco leaves tamarind juice, turmeric, acid mixture of calcium carbonate and jaggery and also placing areca nuts, particular stone and roots of some plants at the site of sting which is believed to absorb the toxin. Antitoxin serum was first prepared in Egypt by Todd in 1909 and has been used since 1930s in some parts of the world with reasonable success. In 1970s and 1980s lytic cocktail was the mainstay of treatment of pulmonary oedema and myocarditis. The use of prazosin in the late 1980s has revolutionized the management of cardiovascular complications of scorpion sting

Autonomic instability from scorpion envenomation may lead to rapid dramatic fluctuations in heart rate and blood pressure. Although many agents have rapid onset they may also have prolonged effects. Prazosin is one drug which is extensively used in India as a pharmacological antidote to scorpion venom. Bawaskar in his study reported 1% mortality after using prazosin compared to 25-30 before the era of prasozin.

Prazosin is a competitive post synaptic alpha1 adrenoreceptorantagonist and is the first line of management since alpha receptor stimulation plays a major role in evolution of the clinical spectrum.

Prazosin suppresses sympathetic outflow and activates venom inhibited potassium channels. It decreases the preload after load and blood pressure without increasing the heart rate. Prasozin counters vasoconstriction induced by endothelin through accumulation of cGMP . This is done by inhibiting the phosphodiesterase enzyme and thus inhibiting formation of inositol triphosphate. Accumulation of cGMP which is a second messenger of nitricoxide in the vascular endothelium and myocardium has a protective effect on the myocardium.

Prazosin reverses both ion tropic and hypo kinetic phases of autonomic storm and also reverses the metabolic effects caused by depressed insulin secretion. Thus prasozin is a cellular and pharmacologic antidote for the actions of scorpion venom and is also cardio protective

Blood pressure, pulse rate and respiration must be monitored every 30 minutes for 3 hours then every hour for next 6 hours. Oral prasozin is fast acting, easily available, cheap and free from anaphylactic reactions and highly effective. It is available as a scored 1 mg tablet. Usual dose of prasozin is 30ug/kg given stat and repeated after 3 hours and later every 6 hours till the extremities are warm and dry and peripheral veins are dilated. The time lapse between the sting and initiation of prazosin for symptoms and autonomic storm determines the outcome.

Oral hydration should be encouraged after giving the tablet. Intravenous maintenance fluids may be required in cases with excessive sweating and vomiting to correct dehydration.

- Prasozin has also reduced mortality in scorpion stings with encephalopathy and pulmonary oedema. Mortality from severe Indian red scorpion envenomation has reduced from 25-30 % in the pre-prazosin era (1961-1983) to less than 1% since the use of prasozin.

- Nifedipine is a calcium channel blocker which is useful for the immediate management of hypertension and helps to reduce myocardial contractility enhanced by autonomic stimulation. It may also have cardioprotective action. Bawaskar has reported that nifedipine combined with prazosin was more successful in preventing myocardial damage than when nifedipine is

given alone. The presence of reflex tachycardia and negative ionotropic effect argues against its routine use

- ACE inhibitors - Captopril is ACE inhibitor which is widely used in the management of congestive cardiac failure and has also been in management of hypertension due to scorpion sting. However a recent experience of the use of captopril in the treatment of cardiovascular manifestations of scorpion sting has found it to be safe and effective with resolution of pulmonary oedema in all 15 cases. Thus captopril can be considered in the management of severe cases of scorpion sting with hypertension and cardiac failure after correction of hypotension with fluid resuscitation and ionotropic drugs.
- Benzodiazepines are often helpful in relieving anxiety. Their effect on GABA open chloride ion channel antagonizes the scorpion toxins ability to stimulate specific ion channels.
- Dopamine is most commonly used in hypodynamic states. By sympathomimetic effect it may actually worsen the condition
- Dobutamine often helpful in cardiac failure with hypotension. It can be administered at 5-15 mg kg min.

Other drugs which are often used but less helpful are-

- Lytic cocktail -pethidine +promethazine+ chlorpromazine .The alpha blocking effect of chlorpromazine might be beneficial but pethidine may

convert sub lethal dose of venom into a lethal dose which may also interfere with protective respiratory reflex .It is no longer used.

- Morphine regarded as drug of choice for acute cardiogenic pulmonary oedema but it may worsen dysrhythmias and may further cause respiratory depression and hence it is not recommended.
- Steroids have not shown any benefit and may in fact enhance the necrotizing effects of excessive catecholamine on myocardium.
- Atropine was once widely used for the management of pulmonary oedema. Atropine has been shown to potentiate tachycardia and sustain hypertension. This is due to complete abolition of parasympathetic activity leading to dominant sympathetic activity. Use of atropine is not recommended except in symptomatic bradycardia.

SCORPION ANTIVENOM

There has been much controversy regarding the usefulness of serotherapy in the management if scorpion envenomation. It acts by neutralizing circulating toxin but the duration between the scorpion sting and development of complications can be short as 30 minutes to few hours.Hence once clinical manifestations develop, the role of antivenom is highly debatable.

The experience with scorpion antivenom therapy in India was limited till recently due to non-availability of specific antivenom for species prevalent in India. A specific antivenom, against the venom of mesonuthus tamulus concanensisprocock species has been available in India since 1997.

Antiscorpion venom serum (AScVS)is a lyophilized monovalent enzyme refined immunoglobulin specific for the species mesobuthus tamylyscocamemsisprocock. It is produced by Haffkine biopharmaceutical corporation ltd. 1 ml of AScVSneutralizes 1 mg of dried scorpion venom. Usual mode of administration is intramuscular or as intravenous infusion.

Disadvantages

- Anaphylaxis and allergy

Anaphylactic reactions were not noted in a clinical trial of ASCVS in India and this has been attributed to the high concentration of adrenaline in the serum due to the catecholamine surge of autonomic storm.

- Doubtful efficacy

Scorpion antivenom is a high molecular weight peptide and takes upto 30 min to be distributed in circulation, in contrast the scorpion venom is a low molecular weight peptide which has a circulation time of 3-5 mins.Thus neutralization of the circulatingtoxin will be inefficientunless scorpion antivenom is administered within few minutes of administration.

Scorpion antivenom has no action on the venom which is already bound to the tissues.

- There is no convincing evidence that antivenom is effective in treatment of human envenomation
- The cost of antivenom therapy is high and it is not widely available

- The species of the offending scorpion varies depending on the geographical location and thus providing species specific venom is a challenge.

Experience

Scorpion antivenom has been used in various parts of the world since 1954 a specific antivenom has been available in India since 1997 though the experience with scorpion amtivenom has been mixed.

Advantages

- Specific modality of treatment for neutralization of venom
- As the scorpion venom stays in the body for more than 36 hours neutralizing the venom and removing the root cause of pathophysiology is the ideal line of management.

Cardiovascular morbidity is more common in India. Mortality due to Indian red scorpion used to be as high as 28% in the late 70s and has reduced to less than 1% with improved management protocol and early initiation of prazosin.

Long term sequelae

Long term morbidity and sequelae was thought to be rare in scorpion sting however sundararaman et al have reported an association between dilated cardiomyopathy and scorpion stings. They proposed a hypothesis that a second insult such as viral infection or alcohol in patients who had developed myocarditis in the past due to scorpion sting may predispose to development of dilated cardiomyopathy. The association is as yet unproven.

SCORPION STING PROTOCOL

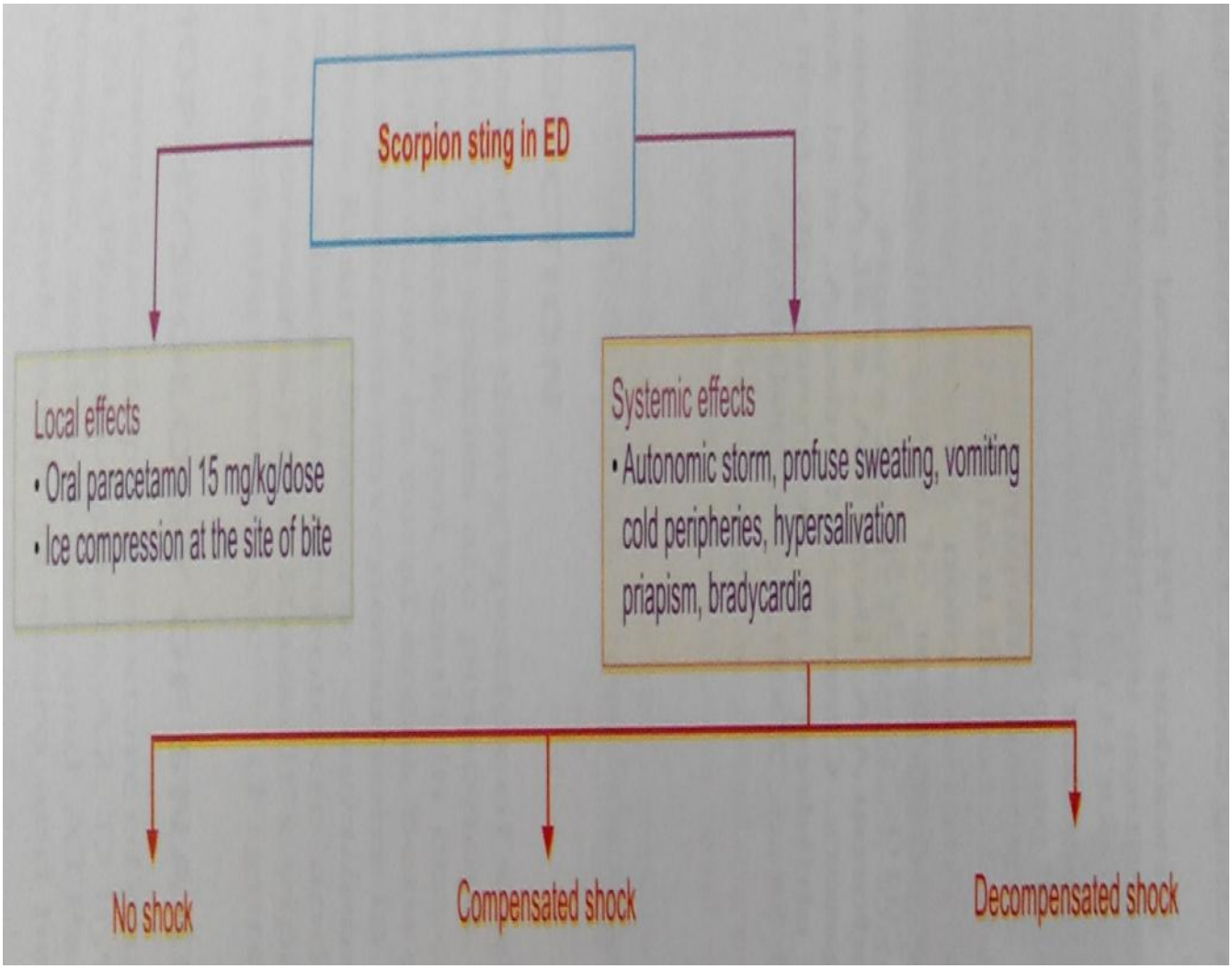


Figure 12: Scorpion Sting Protocol

Local effects are managed with oral paracetamol and ice compressions. Treatment of systemic effects with no shock , compensated and decompensated shock are shown below.

SCORPION STING WITH SYSTEMIC EFFECTS WITHOUT SHOCK

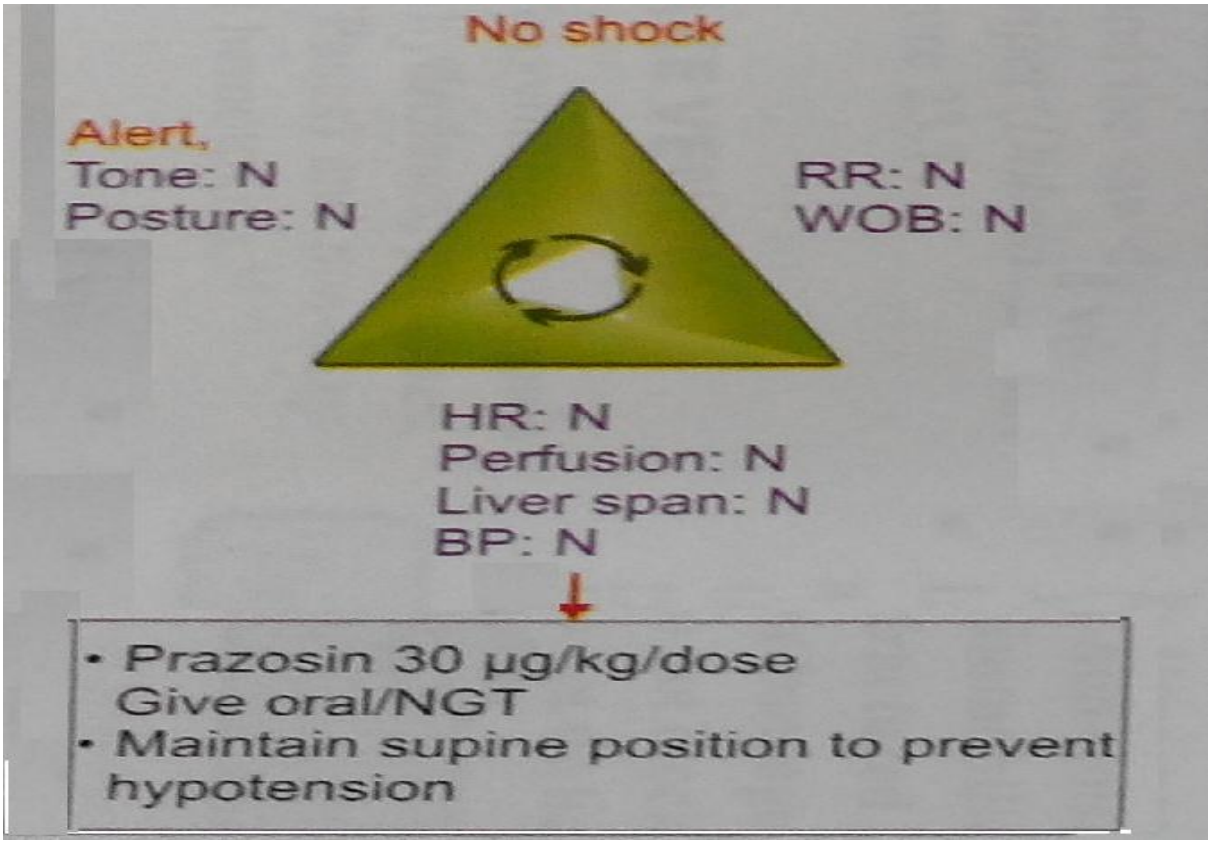


Figure 13: Scorpion sting with systemic effects without shock

Scorpion sting with systemic effects without shock are managed with tablet prazosin 30 microgram per kilogram per dose. Patient is maintained in supine position to prevent hypotension.

SCORPION STING WITH SYSTEMIC EFFECTS WITH COMPENSATED SHOCK

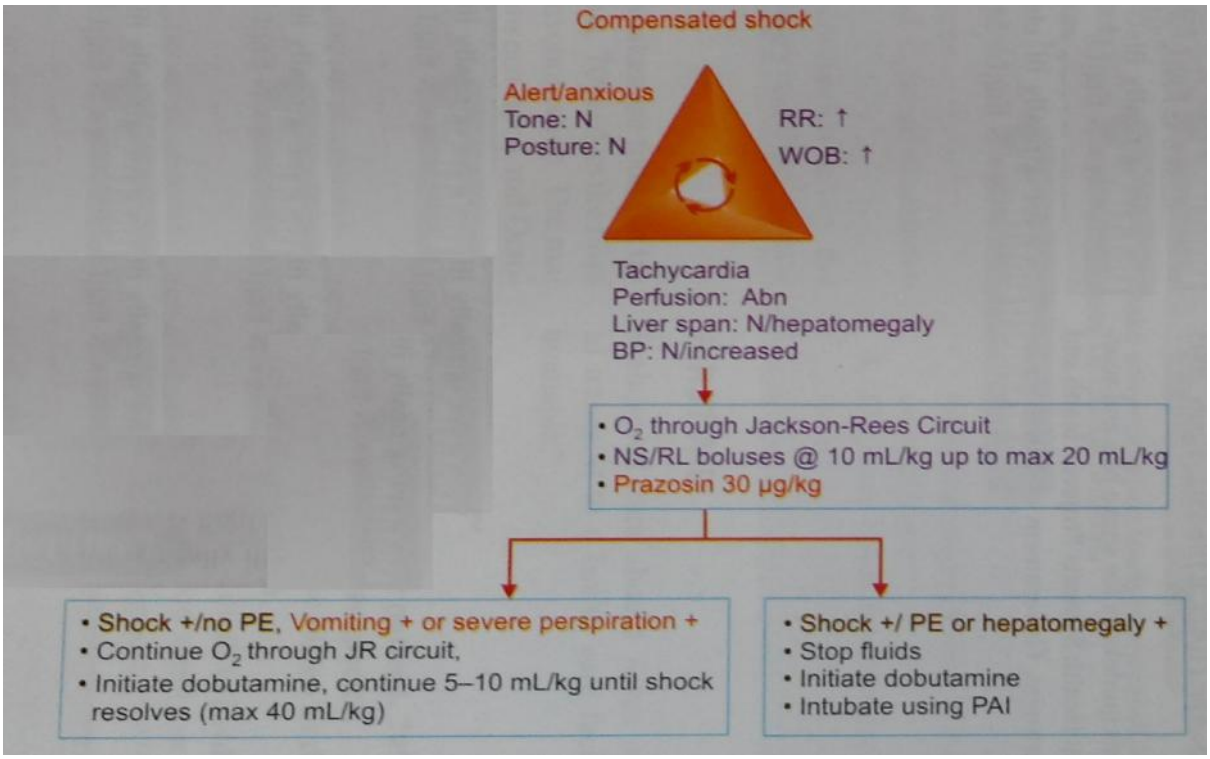


Figure 14: Scorpion sting with systemic effects with compensated shock

Scorpion sting with systemic effects with compensated shock with oxygen, normal saline boluses 10ml per kilogram to a maximum of 20 ml per kilogram and prazosin tablet 30 microgram per kilogram per dose

If shock persists, injection dobutamine infusion will be started at the rate of 10 microgram per kilogram per minute.

SCORPION STING WITH SYSTEMIC EFFECTS WITH DECOMPENSATED SHOCK

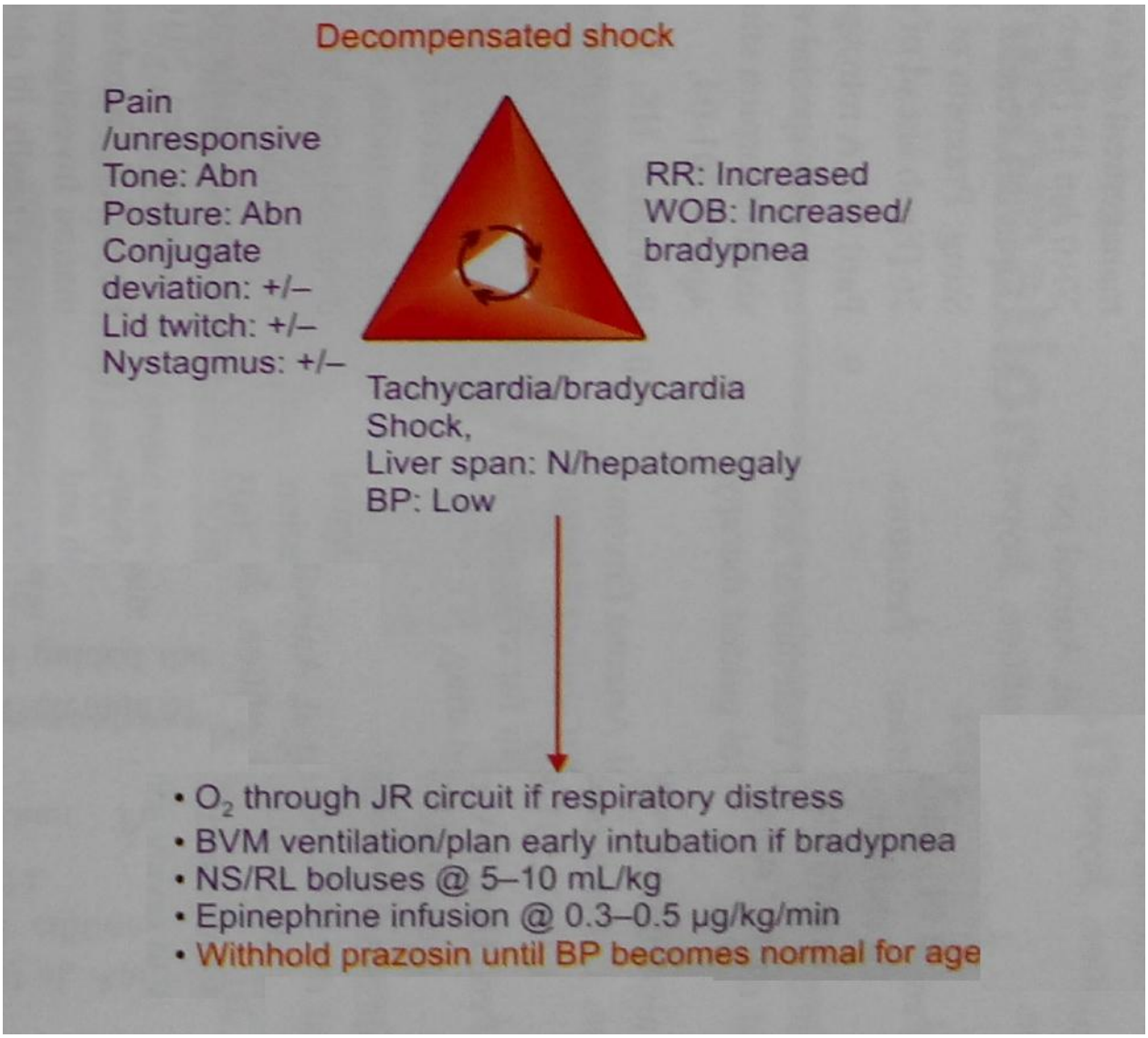


Figure 15: Scorpion sting with systemic effects with decompensated shock

Scorpion sting with systemic effects with decompensated shock is managed with oxygen, normal saline boluses 5-10 ml per kilogram, epinephrine infusion at the rate of 0.3 to 0.5 microgram per kilogram per minute.

Withhold prazosin until blood pressure become normal for age.

PREVENTION

Scorpion sting continues to remain a major public health problem in many underdeveloped countries including India. Scorpion stings are responsible for a number of deaths each year and also cause significant loss in economic productivity and human potential resulting from the many non-fatalenvenomations that occur annually.

The following preventive measures can be considered

- Clear all debris and trash from areas surrounding homes and the work place.
- Shoes, gloves, clothing bedding etc. should be checked prior to use
- Children should be prevented from going out alone in the night and prevented from exploring hidden places
- Avoidance of barefoot walking and use of appropriate light source like torch to prevent accidental stepping over scorpions in the night
- Improve housing standards in rural area and encourage construction of pukka houses with cemented walls and flooring
- Avoid sleeping in the floors as it increases risk of accidental stings
- Roofs and walls of dwellings should be checked regularly crevices should be plugged and regular painting of walls should be encouraged

- Spraying 10% DDT + 0.2 permethrin + 2 % chlorine in oil or fuel oil +kerosene +creosote as a spray in roof of dwellings and building foundations
- Biological control using chickens, ducks and owls which hunt scorpion can be tried.

METHODOLOGY	
Type of study	**Descriptive study**
Setting	**Government Rajamirasdar Hospital , Thanjavur**
Duration	**January 2014 to July 2014**
INCLUSION CRITERIA	1.Children upto 12 year of age admitted with history of scorpion sting at **Government Rajamirasdar Hospital, Thanjavur** **2.** Children with history of unknown bite coupled with classic clinical manifestations of scorpion sting were also included in the study
Exclusion Criteria	**1**.Children with scorpion sting but treated elsewhere and referred for higher center care whose initial presentation and treatment details were not available **2**. Children with co-morbid illness like congenital heart disease and severe respiratory illnesses

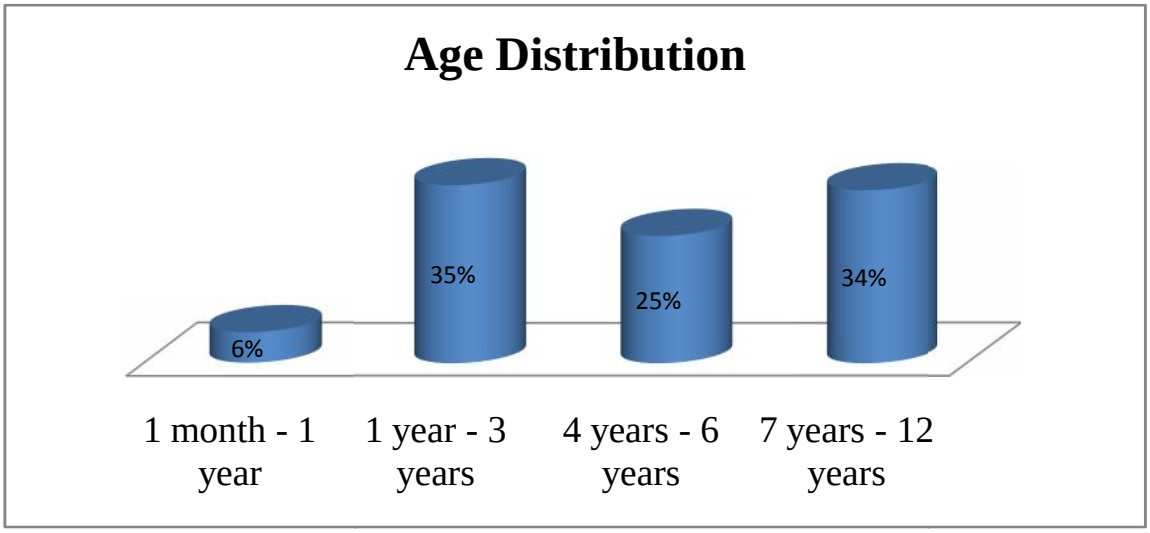
Maneuver	141 cases of scorpion sting admitted to government raja mirasdhar hospital , thanjavur from January 2014 to july 2014 were included in the study except those come under exclusion criteria. History and Clinical presentation at the time of admission were noted using the proforma. Follow up of the clinical parameters such as duration to achieve normalcy of heart rate, respiratory rate, BP, priapism and overall wellbeing of the child will be done till discharge or death. Comparison and statistical analysis will be done. All patients with peripheral circulatory failure was treated with tablet prazosin 30 microgram per kilogram per dose, intravenous fluids and supportive measures. Second dose of prazosin was given after three hours and third dose after six hours till peripheries became warm.

	Myocarditis was treated with oxygen, intravenous fluids, prazosin, dobutamine infusion. Pulmonary oedema was treated with oxygen, prazosin, dobutamine infusion, frusemide and mechanical ventilation if indicated. All cases were managed and monitored for complications and treated accordingly.

RESULTS

Table 1: Age distribution

Sl.No	Age	No. of Cases	Percentage
1	1 month - 1 year	8	6
2	1 year - 3 years	50	35
3	4 years - 6 years	36	25
4	7 years - 12 years	47	34
Total		141	100



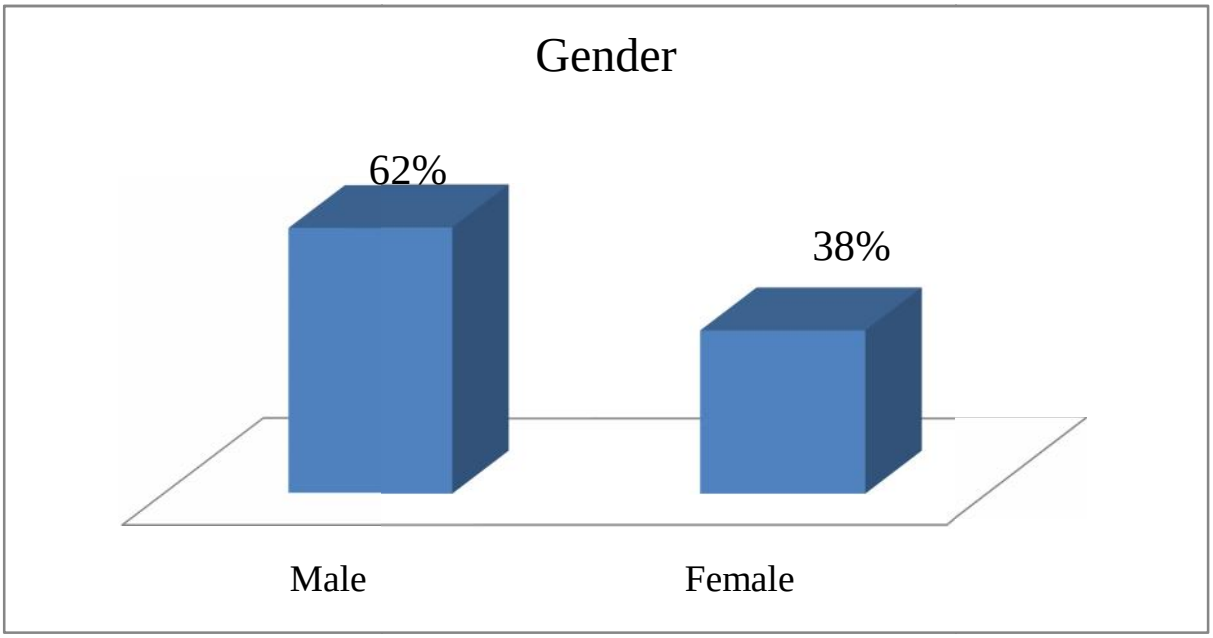
Graph 1: Age Distribution

Maximum number of cases were noted in age gropes of 1 - 3 and 7 - 12 years.

Minimum number of cases were in the age group of 1 month to one year.

Table 2: Gender Distribution

Sl.No	Gender	No. of Cases	Percentage
1	Male	87	62
2	Female	54	38
Total		141	100

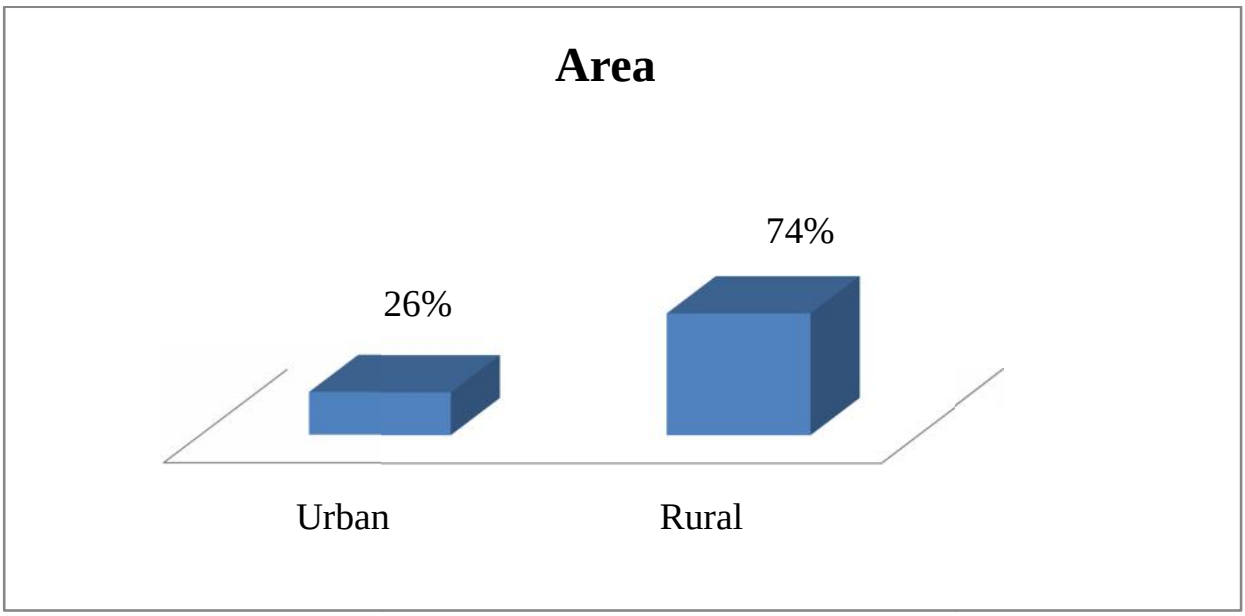


Graph 2: Gender Distribution

Scorpion Sting were more common in males. This could be because of male children are more exploratory and wander outside.

Table 3: Urban or Rural Area

Sl.No	Areas	No. of Cases	Percentage
1	Urban	36	26
2	Rural	105	74
Total		141	100

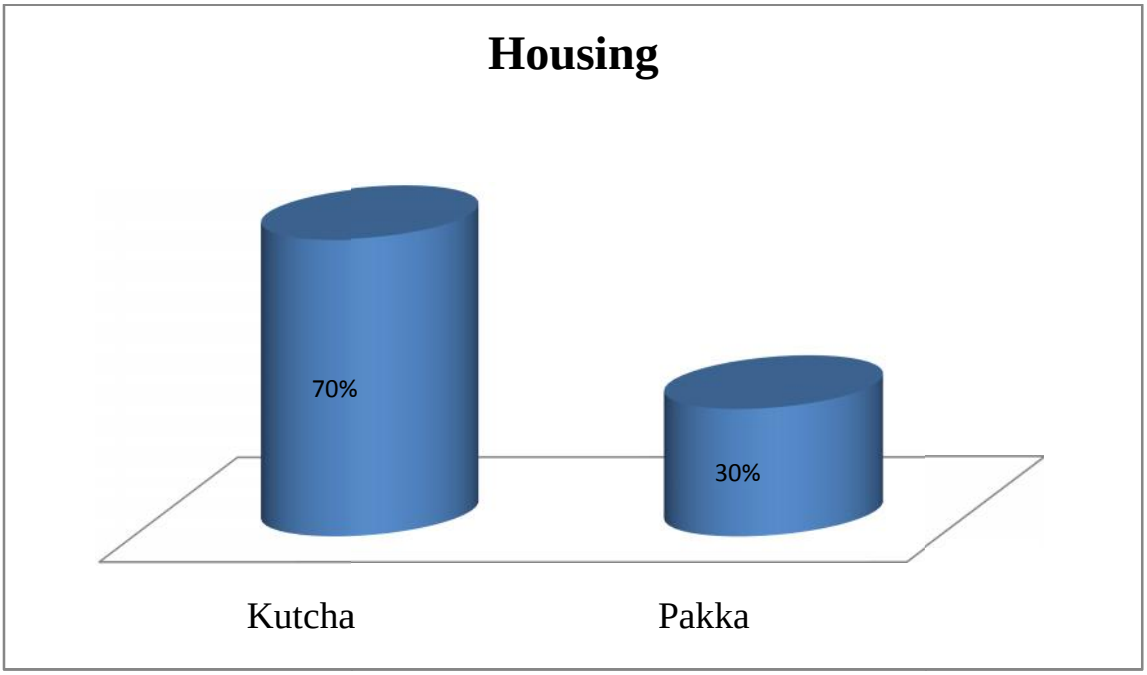


Graph 3: Area Distribution

Majority of cases were from rural areas. This could be because more number of kutcha houses and agricultural fields in rural areas.

Table 4: Type of Housing

Sl.No	Housing	No. of Cases	Percentage
1	Kutcha	99	70
2	Pakka	42	30
Total		141	100

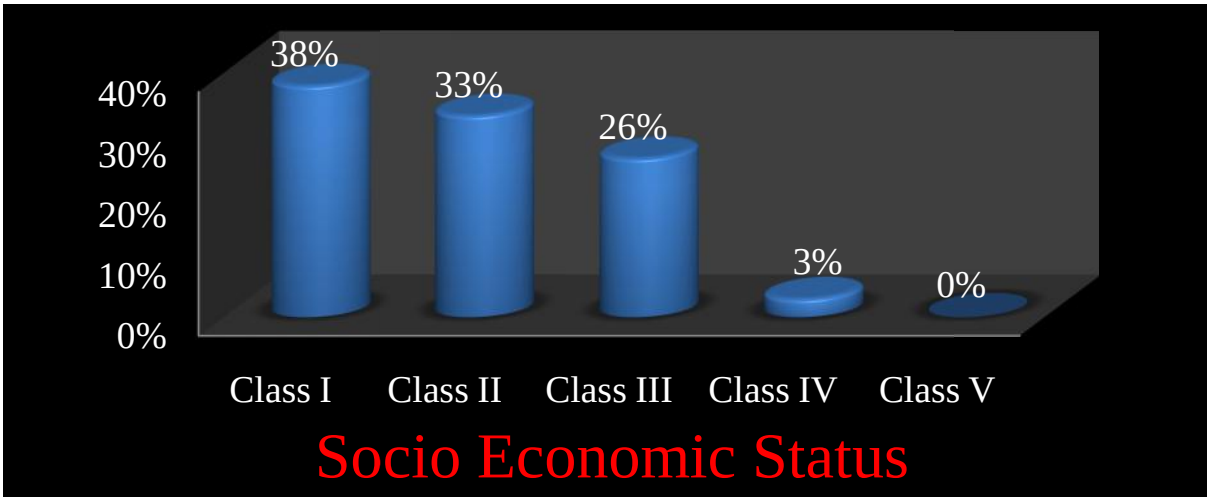


Graph 4: Type of Housing

Majority of cases were from kutcha house. This could be because scorpions inhabit the crevices in kutcha houses which is quite uncommon in the pakka houses.

Table 5: Socio Economic Status

Sl.No	Socio Economic Status	No. of Cases	Percentage
1	Class I	53	38
2	Class II	46	33
3	Class III	36	26
4	Class IV	6	3
5	Class V	0	0
		141	100

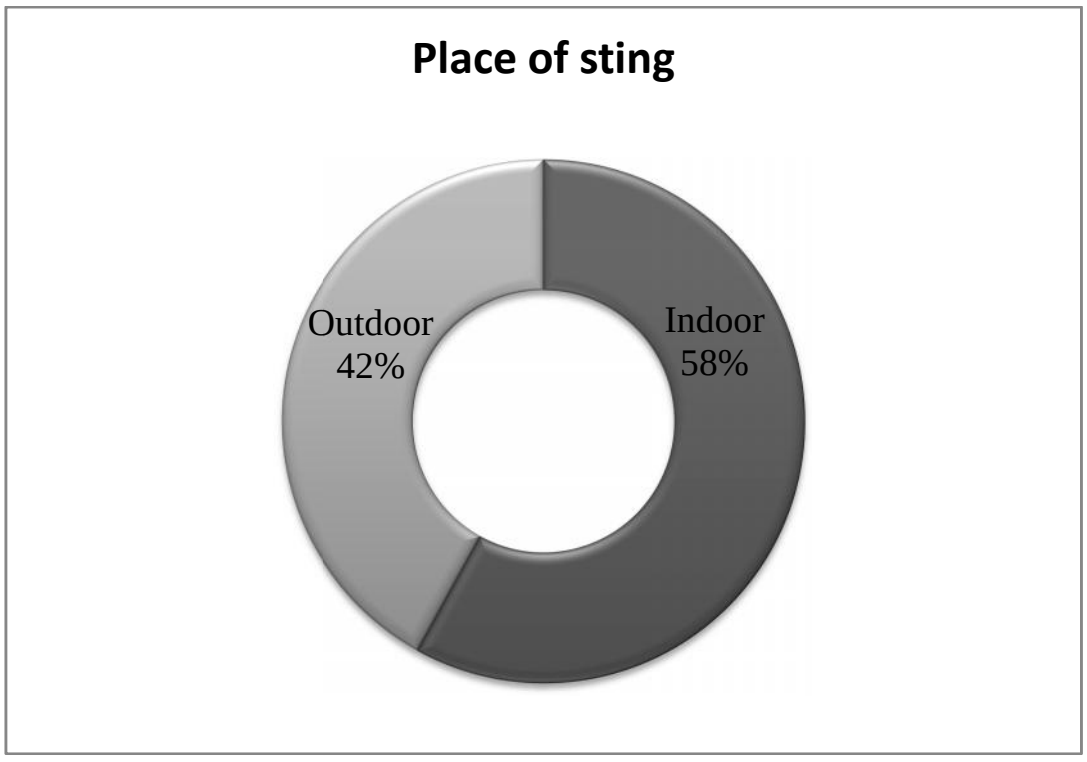


Graph 5: Socio Economic Status

cases were noted in all classes, except class V. class I and class II together accounted for around 71% of cases.

Table 6: Place of sting – Indoor and Outdoor

Sl.No	Place of Sting	No. of Cases	Percentage
1	Indoor	82	58
2	Outdoor	59	42
		141	100

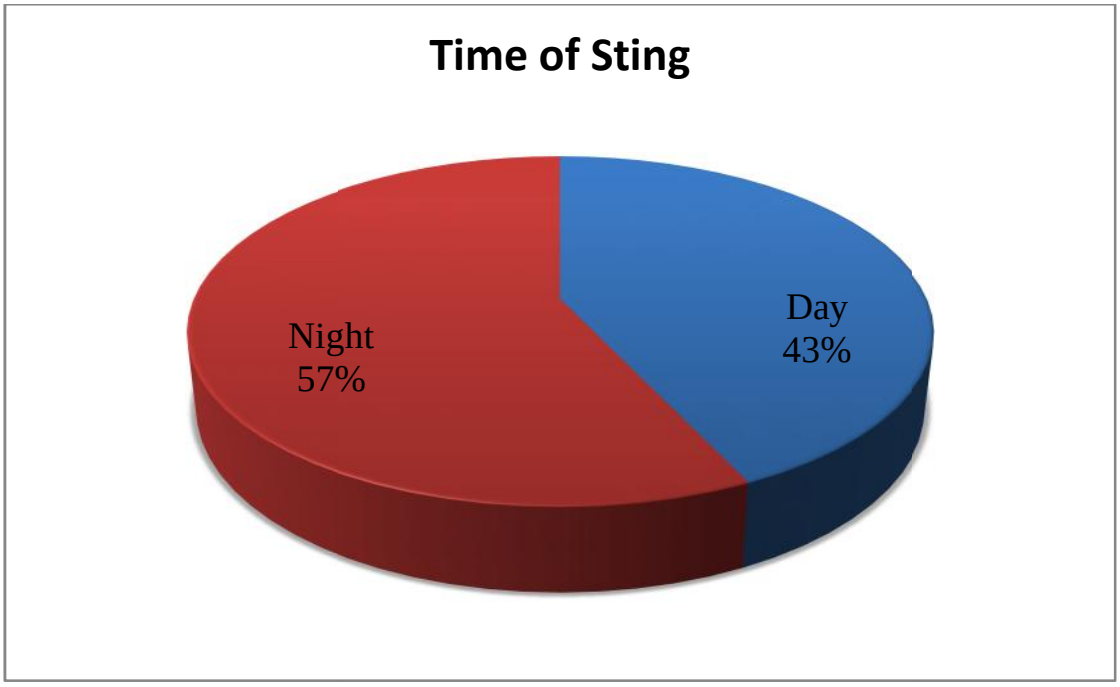


Graph 6: Place of sting – Indoor and Outdoor

Most of the stings occurred in indoor. This could be because scorpions are nocturnal in habit.

Table 7: Time of Sting – Day or Night

Sl.No	Time	No. of Cases	Percentage
1	Day	60	43
2	Night	81	57
		141	100

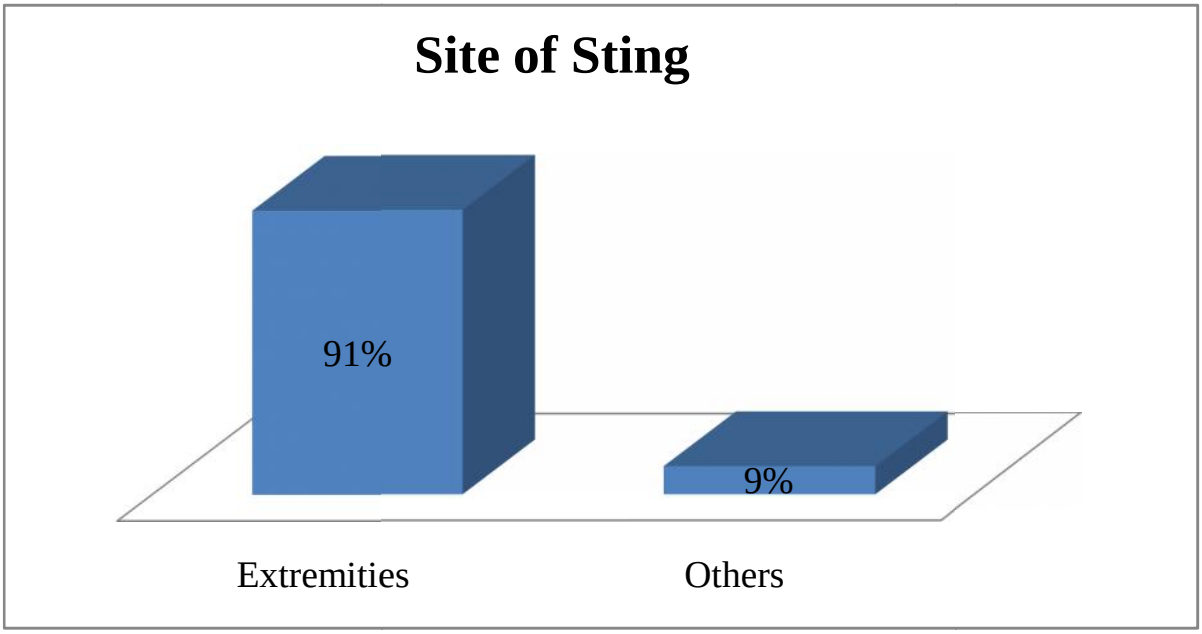


Graph 7: Time of Sting – Day or Night

Stings during the night time were more common (57%)than stings during the day (43%).

Table 8: Site of Sting

Sl.No	Site of Sting	No. of Cases	Percentage
1	Extremities	128	91
2	Others	13	9
		141	100

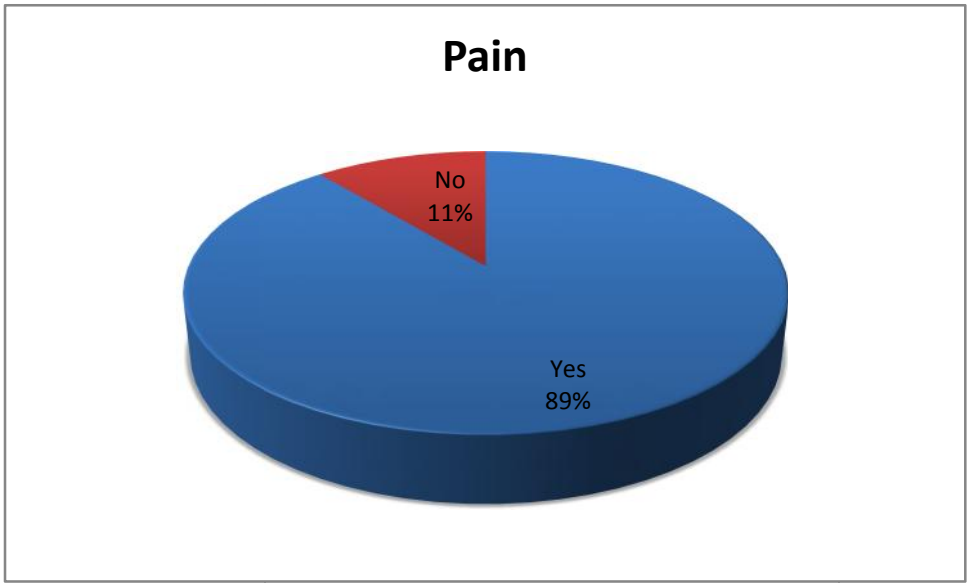


Graph 8: Site of Sting

Majority of stings were sustained on the extremities(91%). Only 9% of stings were sustained on other parts of body like head, face, abdomen, etc…

Table 9: Pain

Sl.No	Pain	No. of Cases	Percentage
1	Yes	126	89
2	No	15	11
		141	100

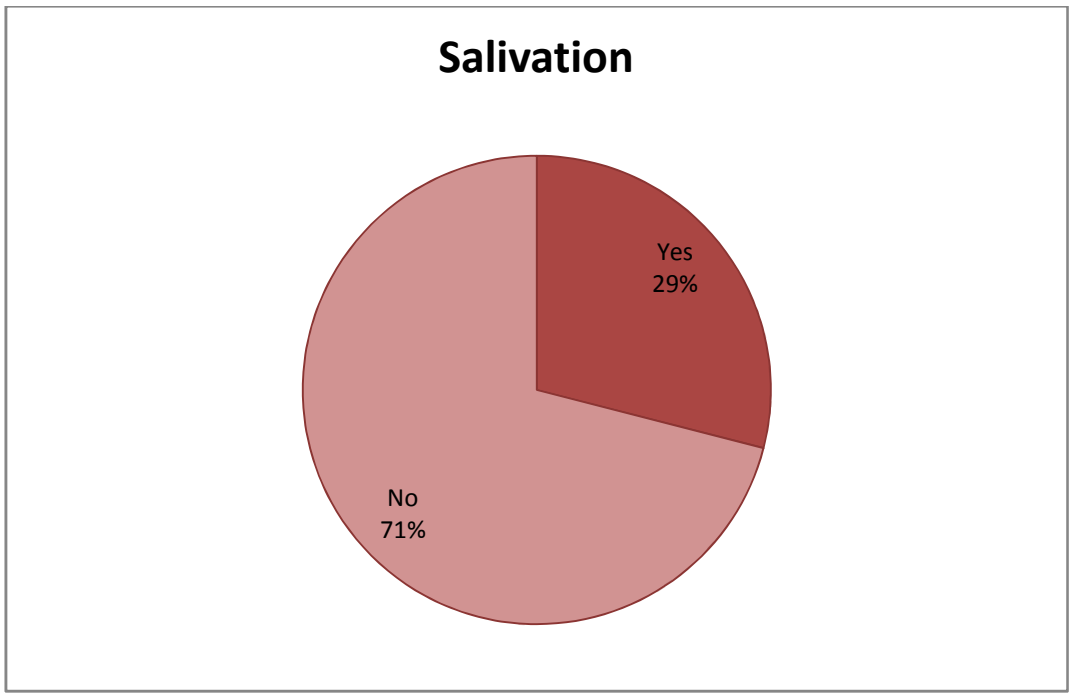


Graph 9: Pain

About 89% of cases had pain over the sting site.

Table 10: Salivation

Sl.No	Salivation	No. of Cases	Percentage
1	Yes	41	29
2	No	100	71
		141	100

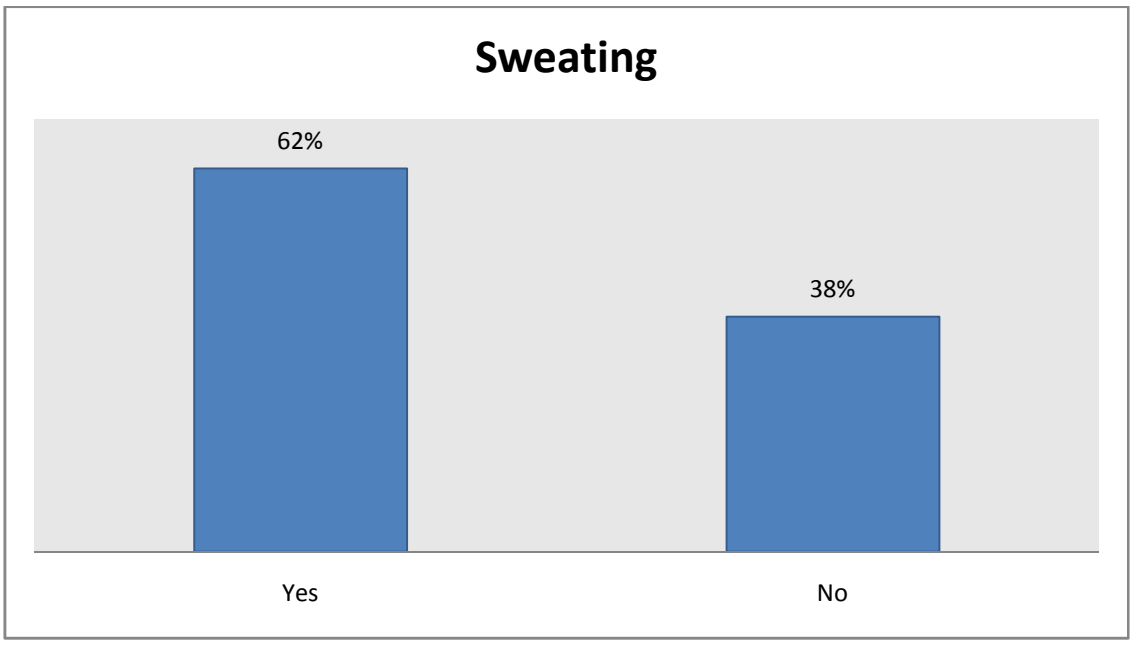


Graph 10: Salivation

29% of cases had salivation while 71% did not have salivation.

Table 11: Sweating

Sl.No	Sweating	No. of Cases	Percentage
1	Yes	88	62
2	No	53	38
		141	100

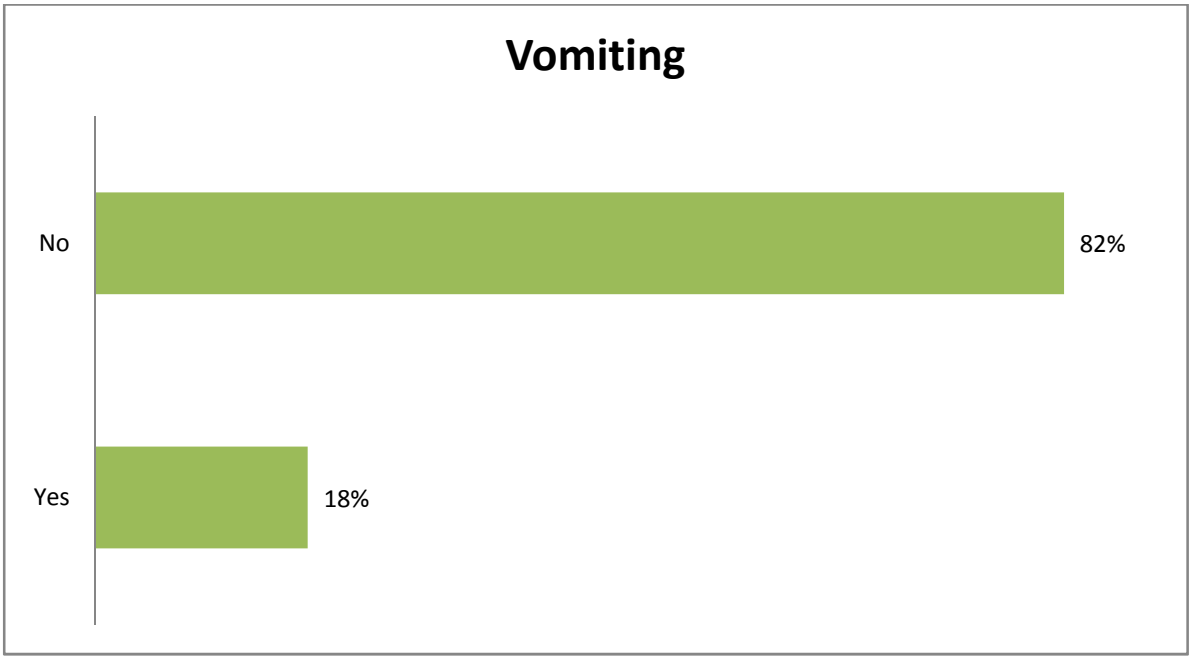


Graph 11: Sweating

62% of cases had sweating while 38% did not have sweating.

Table 12: Vomiting

Sl.No	Vomiting	No. of Cases	Percentage
1	Yes	26	18
2	No	115	82
		141	100

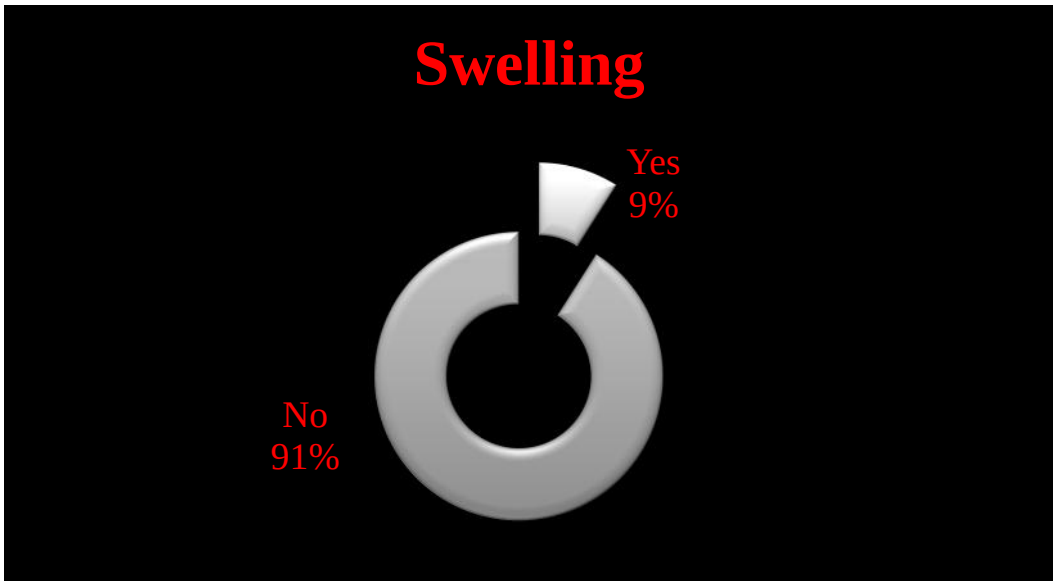


Graph 12: Vomiting

18% of cases had vomit while 82% did not have vomit.

Table 13: Swelling

Sl.No	Swelling	No. of Cases	Percentage
1	Yes	13	9
2	No	128	91
		141	100

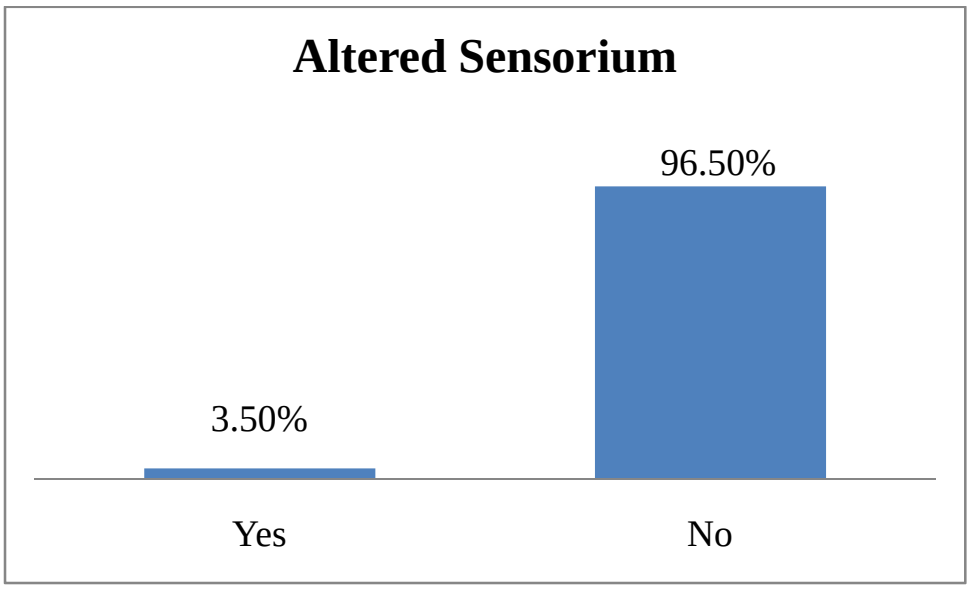


Graph 13: Swelling

9% of cases had swelling over sting site while 91% did not have swelling.

Table 14: Altered Sensorium

Sl.No	Altered Sensorium	No. of Cases	Percentage
1	Yes	5	3.5
2	No	136	96.5
		141	100

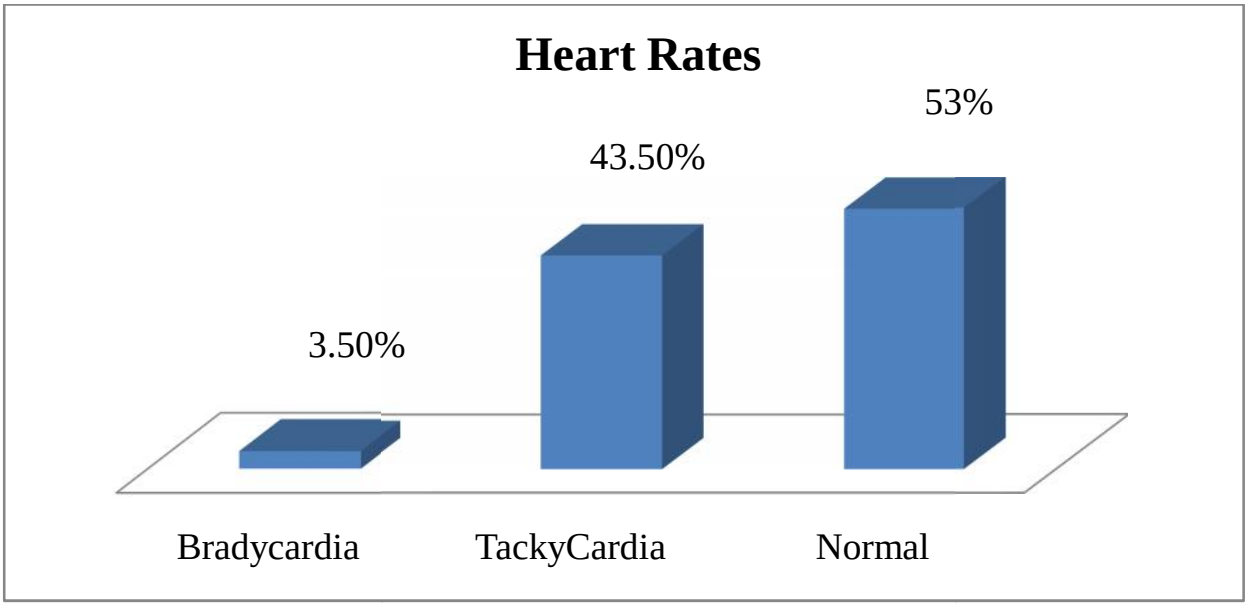


Graph 14: Altered Sensorium

Only 3.5% of cases had altered sensorium . remaining 96.5% of cases did not have altered sensorium.

Table 15: Heart Rate

Sl.No	Heart Rates	No. of Cases	Percentage
1	Bradycardia	5	3.5
2	TackyCardia	61	43.5
3	Normal	75	53
		141	100

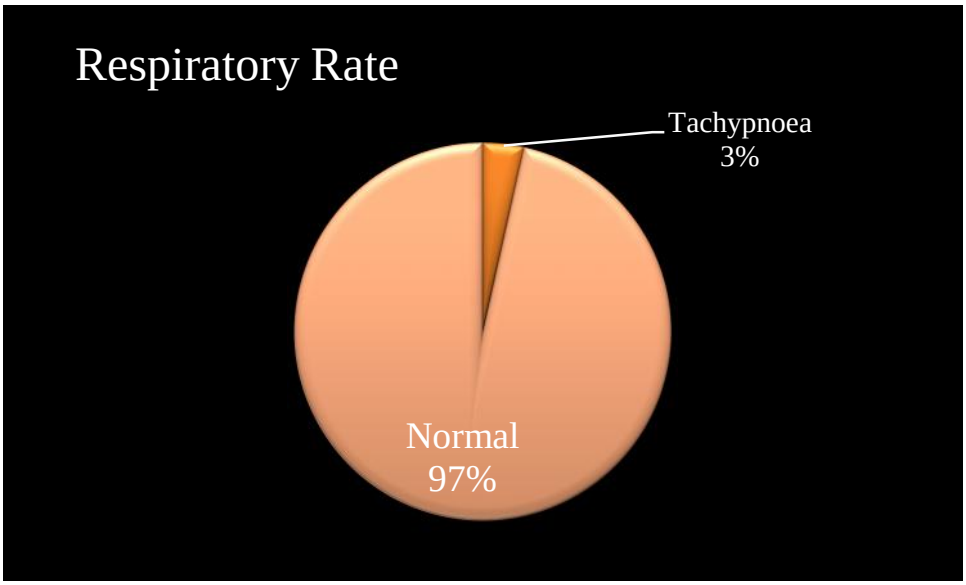


Graph 15: Heart Rate

53% of cases had normal heart rate . remaining 43.5% and 3.5% cases had tachycardia and bradycardia respectively.

Table 16: Respiratory Rate

Sl.No	Respiratory Rate	No. of Cases	Percentage
1	Tachypnea	6	3.5
2	Normal	135	96.5
		141	100

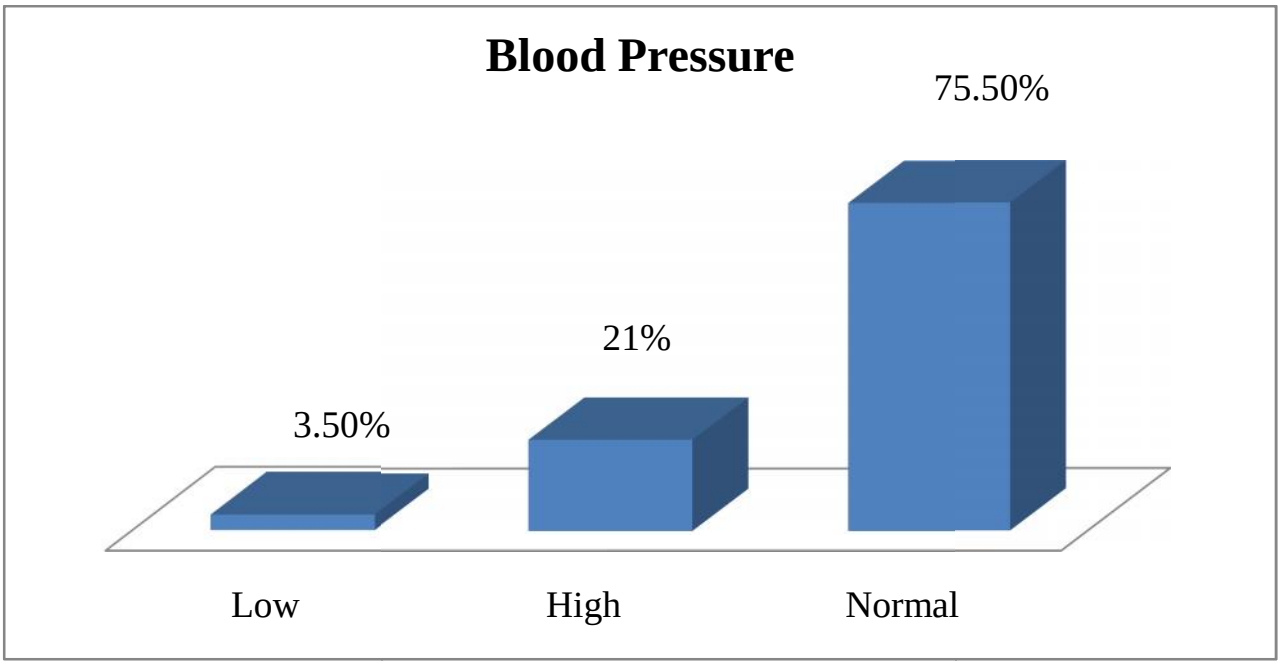


Graph 16: Respiratory Rate

Majority of cases (97%) had normal respiratory rate. 3% of cases had tachypnoea.

Table 17: Blood Pressure

Sl.No	Blood Pressure	No. of Cases	Percentage
1	Low	6	3.5
2	High	30	21
3	Normal	115	75.5
		141	100

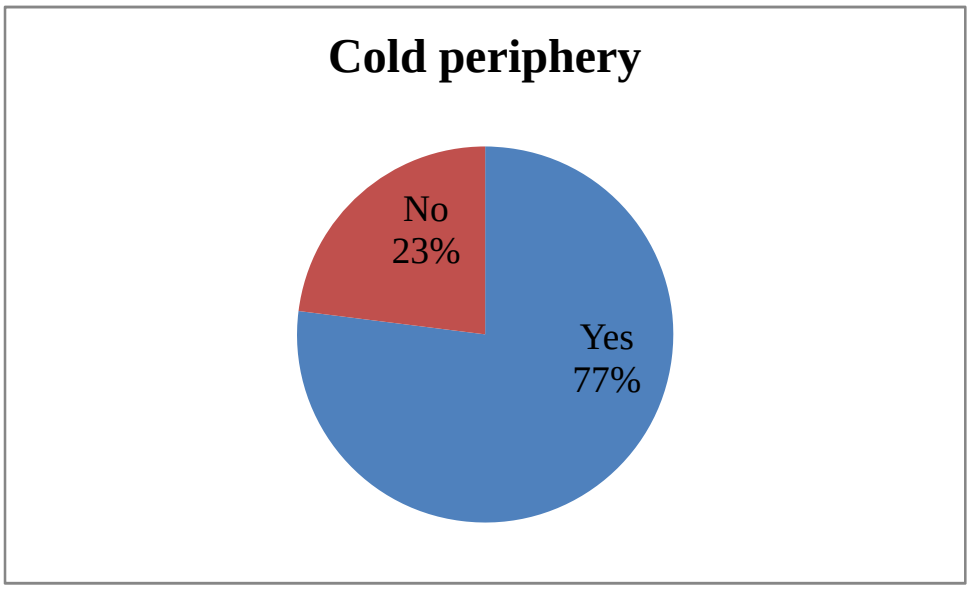


Graph 17: Blood Pressure

Majority of cases (75.5%) had normal blood pressure. remaining 21% and 3.5% of cases had high and low blood pressure respectively.

Table 18: Cold periphery

Sl.No	Cold periphery	No. of Cases	Percentage
1	Yes	109	77
2	No	32	23
		141	100

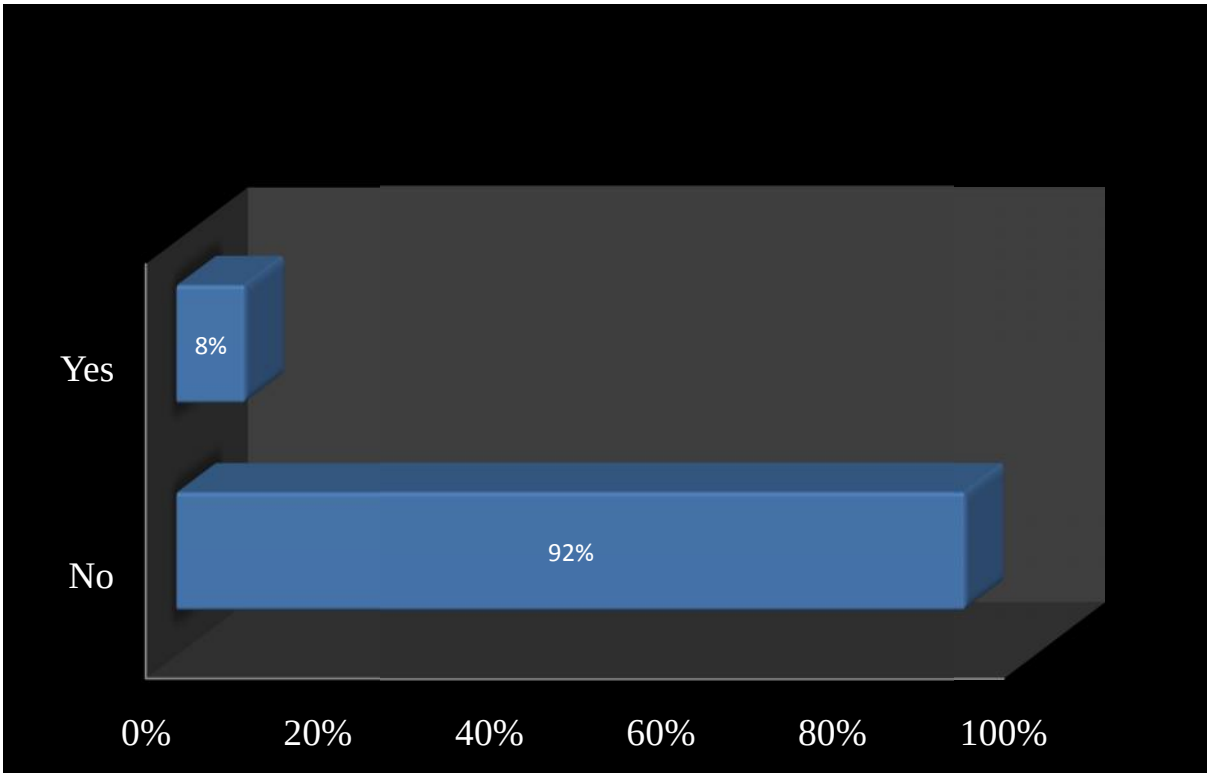


Graph18: Cold periphery

77% of cases had cold peripheries and 23% of cases do not have cold peripheries.

Table 19: Breathing Difficulty

Sl.No	Breathing Difficulty	No. of Cases	Percentage
1	No	130	92
2	Yes	32	8
		141	100

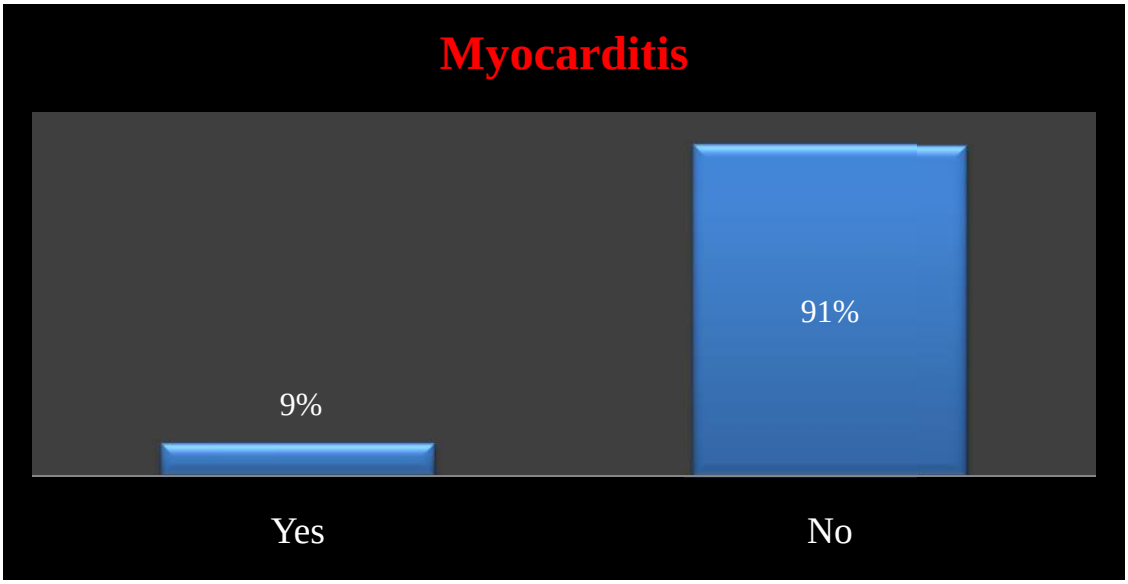


Graph 19: Breathing Difficulty

Majority of cases (92%) did not have breathing difficulty. only 8% of cases had breathing difficulty.

Table 20: Myocarditis

Sl.No	Myocarditis	No. of Cases	Percentage
1	Yes	12	9
2	No	129	91
		141	100

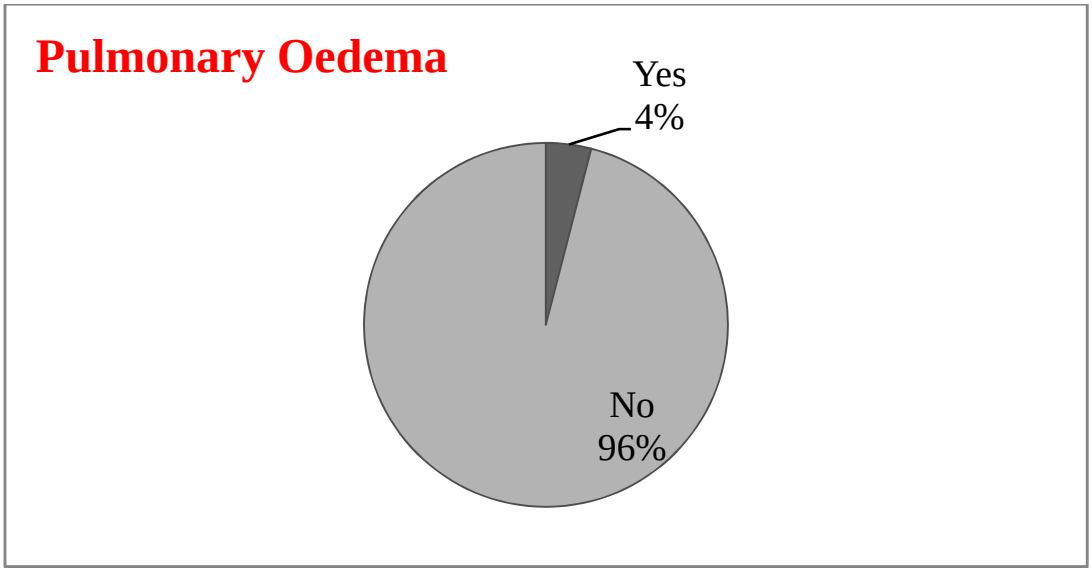


Graph 20: Myocarditis

9% of cases had myocarditis. majority of cases (91%) did not have myocarditis.

Table 21: Pulmonary Oedema

Sl.No	Pulmonary Oedema	No. of Cases	Percentage
1	Yes	6	4
2	No	135	96
		141	100

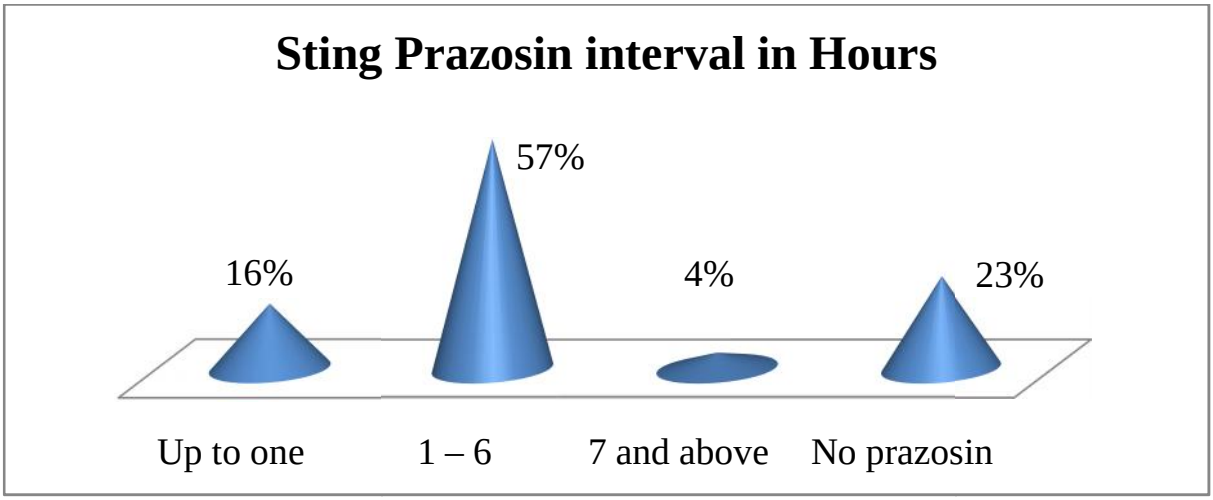


Graph 21: Pulmonary Oedema

4% of cases had pulmonary oedema. majority of cases (96%) did not have pulmonary oedema.

Table 22: Sting Prazosin interval

Sl.No	Sting Prazosin interval in Hours	No. of Cases	Percentage
1	Up to one	22	16
2	1 – 6	81	57
3	7 and above	6	4
4	No prazosin	32	23
		141	100

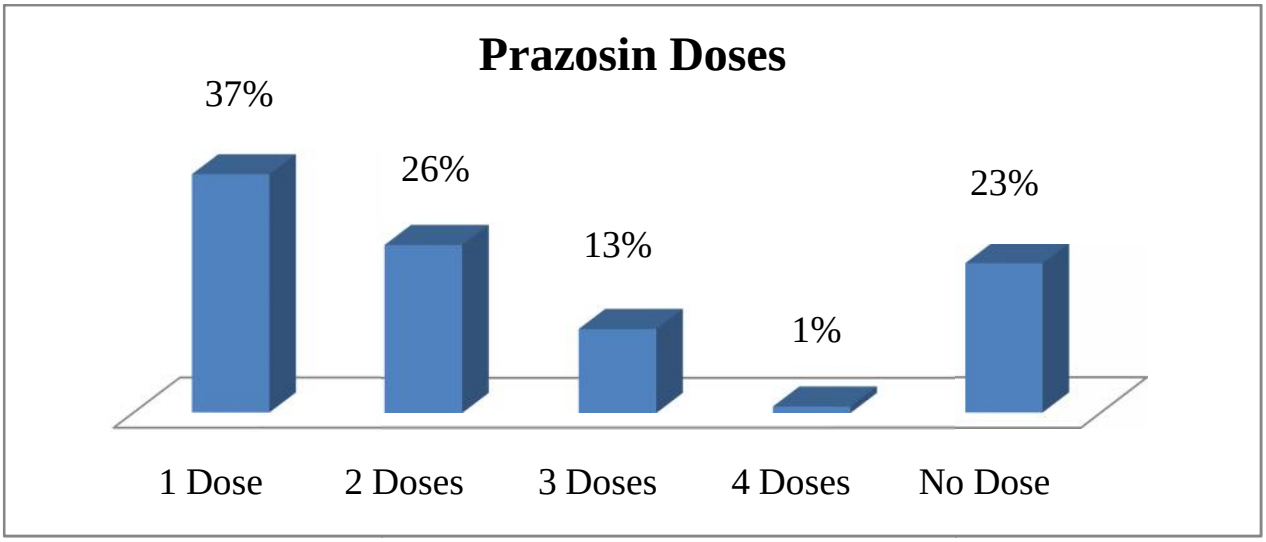


Graph 22: Sting Prazosin interval

57% of cases received the first dose of prazosin from 1 to 6 hours. only 16% of cases received the first dose of prazosin within one hour.

Table 23: Prazosin Doses

Sl.No	Prazosin Doses	No. of Cases	Percentage
1	1 Doses	52	37
2	2 Doses	37	26
3	3 Doses	18	13
4	4 Doses	2	1
5	No Doses	32	23
		141	100

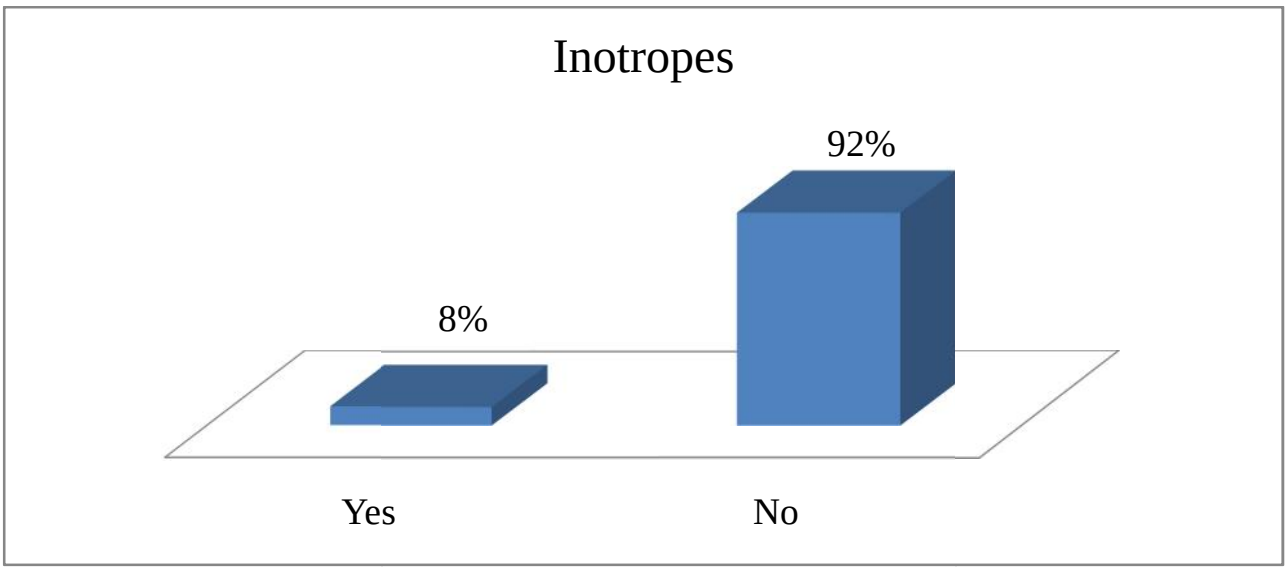


Graph 23: Prazosin Doses

37% of cases required single dose of prazosin for the reversal of autonomic storm. 39% of cases required two or three doses of prazosin for the reversal of autonomic storm.

Table 24: Inotropes

Sl.No	Inotropes	No. of Cases	Percentage
1	Yes	11	8
2	No	140	92
		141	100

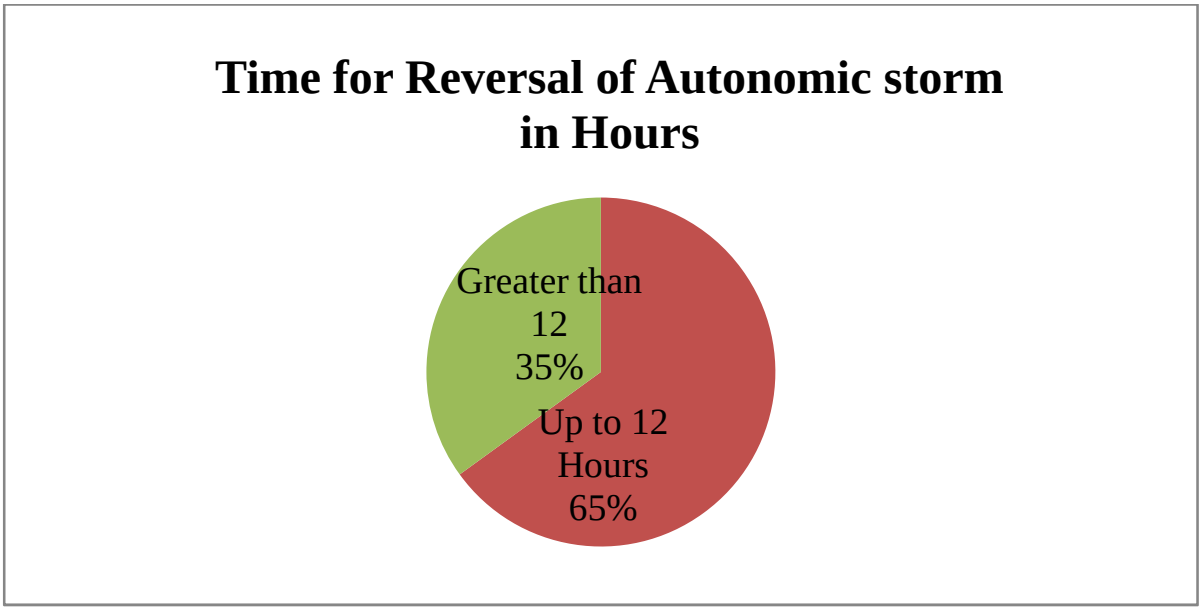


Graph 24: Inotropes

8% of cases needed inotropic support . 92% of cases did not need inotropic support.

Table 25: Time for Reversal of Autonomic storm

Sl.No	Time for Reversal of Autonomic storm in Hours	No. of Cases	Percentage
1	Up to 12 Hours	71	65
2	Greater than 12	38	35
		109	100



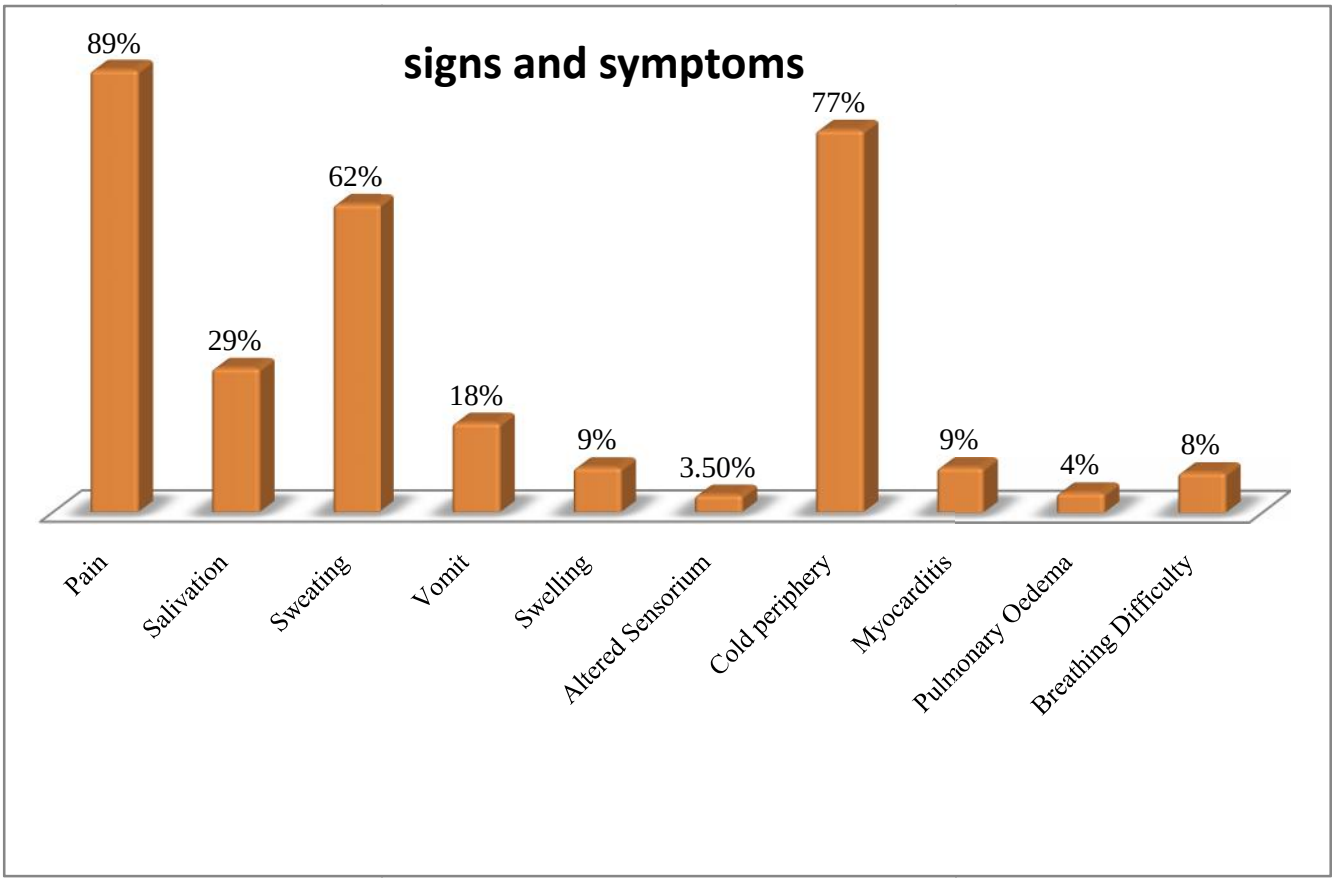
Graph 25: Time for Reversal of Autonomic storm

Autonomic storm was reversed within 12 hours in 65% of cases. for remaining 35% of cases it took more than 12 hours for reversal of autonomic storm.

Table 26: Signs and Symptoms

Sl.No	Signs and Symptoms	No. of Cases	Percentage
1	Pain	126	89
2	Salivation	41	29
3	Sweating	88	62
4	Vomit	26	18
5	Swelling	13	9
6	Altered Sensorium	5	3.5
7	Cold periphery	109	77
8	Myocarditis	12	9
9	Pulmonary Oedema	6	4
10	Breathing Difficulty	130	92

Pain is invariably present in all cases. Cold peripheries in 77% of cases. Altered sensorium in 3.5% of cases.

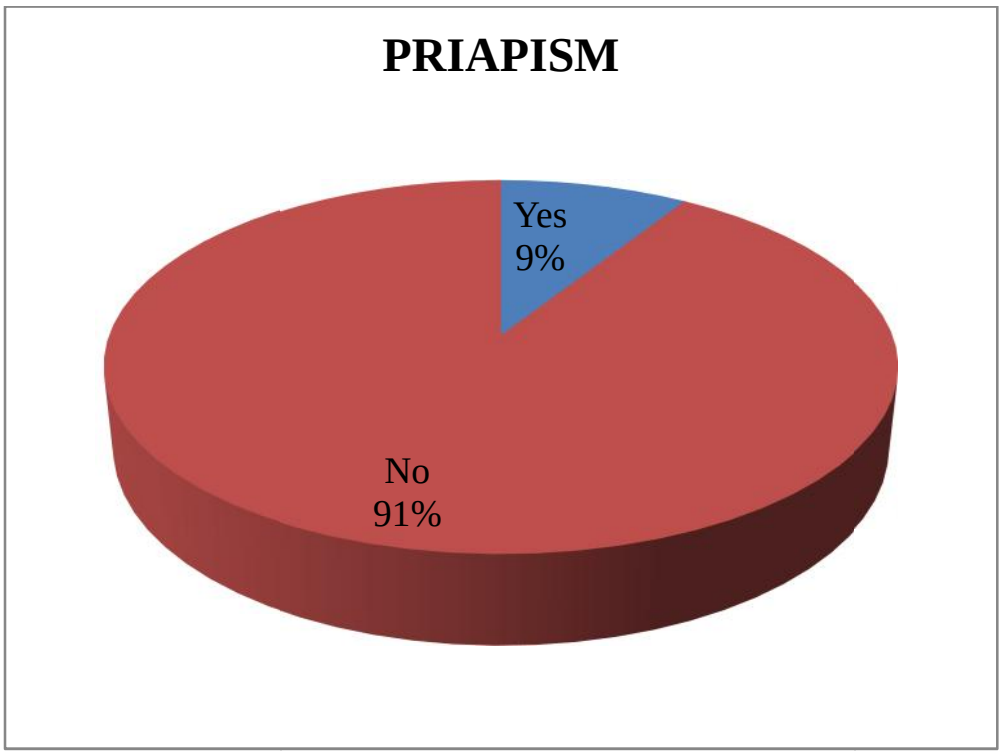


Graph 26: Signs and Symptoms

Pain was invariably present in most of the cases (89%). cold peripheries in 77% and sweating in 62% of cases .

Table 27: Priapism

Sl.No	Priapism	No. of Cases	Percentage
1	Yes	8	9%
2	No	80	91%

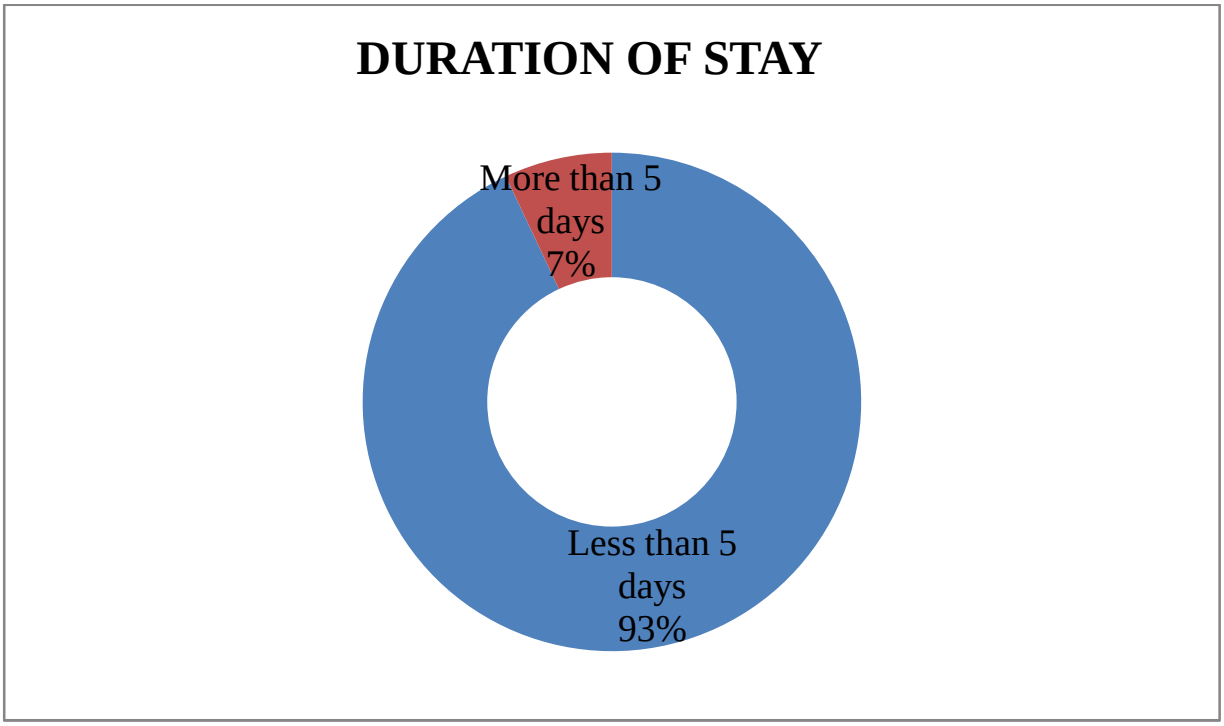


Graph.27: Priapism

Priapism is found in 8 cases. Priapism is usually associated with cardiovascular complications.

Table 28: Duration Of Stay

Sl.No	Duration of stay	No. of Cases	Percentage
1	Less than 5 days	131	93%
2	More than 5 days	10	7%

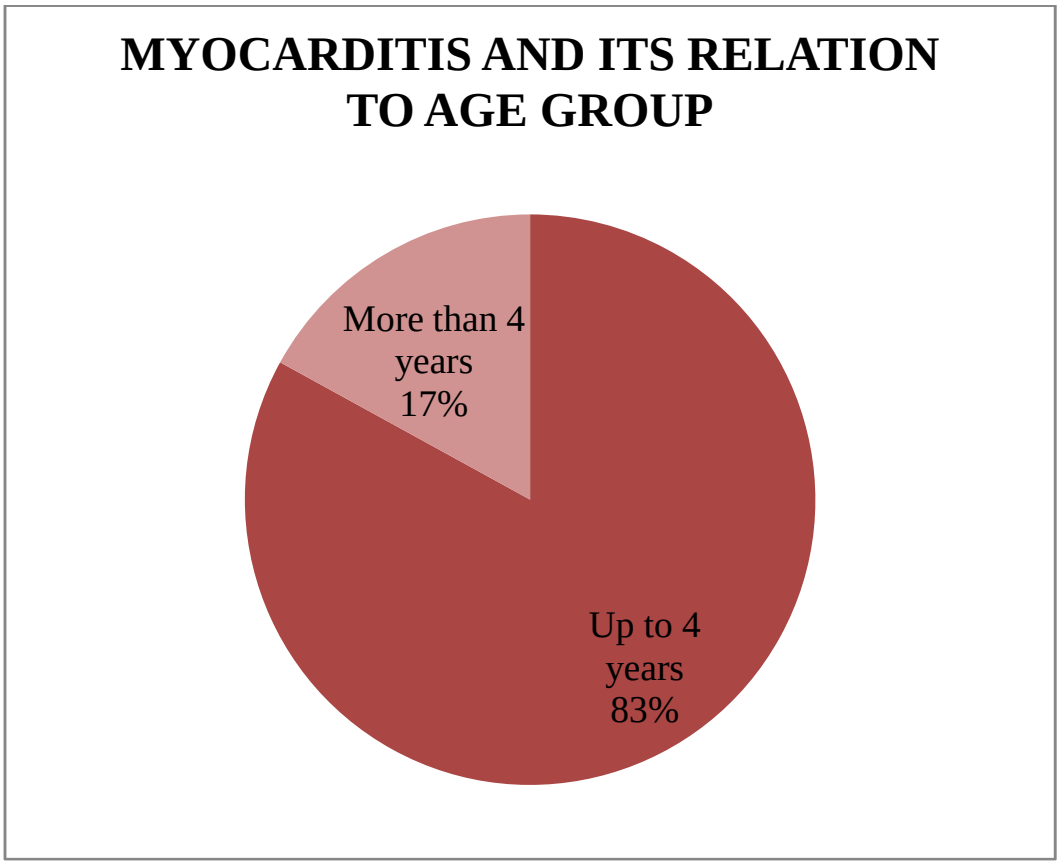


Graph. 28: Duration Of Stay

Duration of stay is less than 5 days in 93% of cases. The average stay duration is 2 to 5 days.

Table 29: Myocarditis And Its Relation To Age Group

Sl.No	Age	No. of Cases	Percentage
1	Up to 4 years	10	83%
2	More than 4 years	2	17%

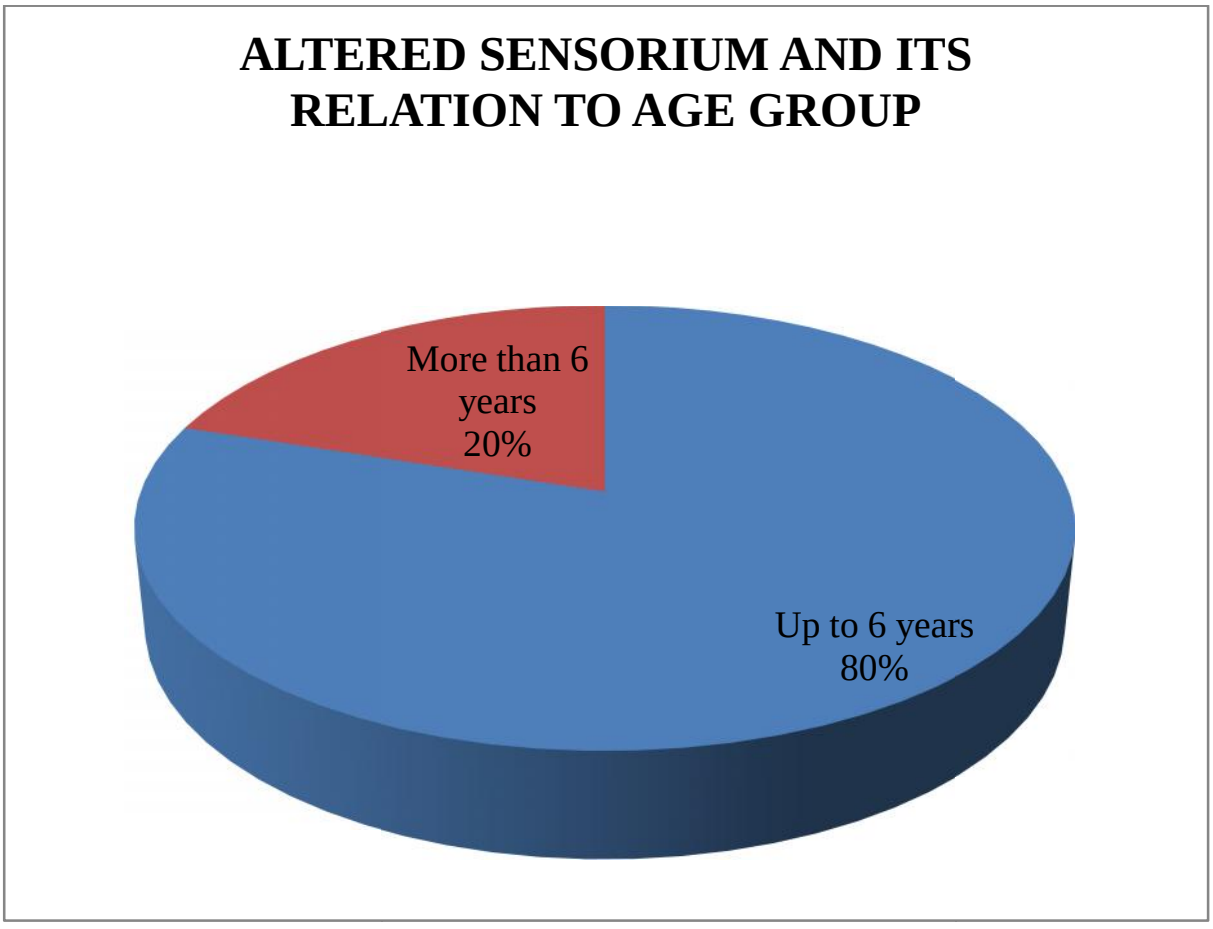


Graph 29: Myocarditis And Its Relation To Age Group

Myocarditis is more common in children less than 4 year of age (83%) than children above 4 year of age (17%)

Table 30: Altered Sensorium And Its Relation To Age Group

Sl.No	Age	No. of Cases	Percentage
1	Up to 6 years	4	80%
2	More than 6 years	1	20%

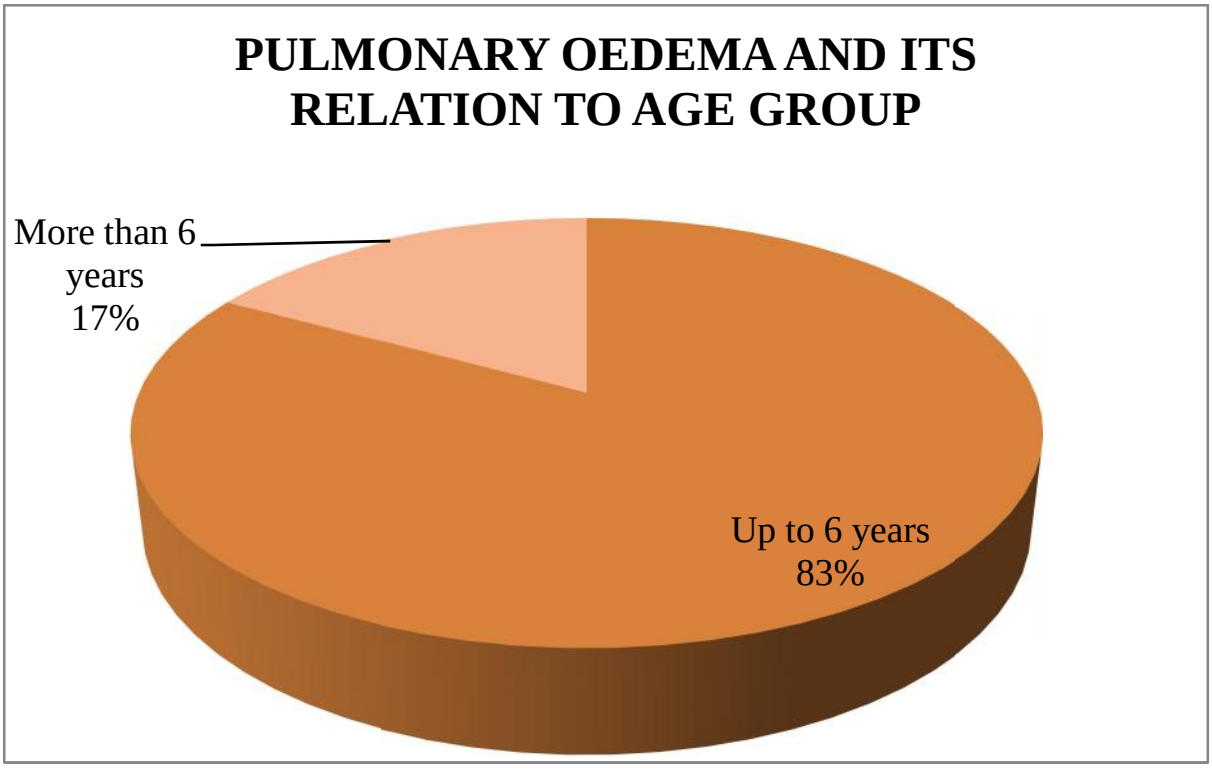


Graph. 30: Altered Sensorium And Its Relation To Age Group

Altered sensorium is more common in children less than 6 year of age (80%) than children above 6 year of age (20%)

Table 31: Pulmonary Oedema And Its Relation To Age Group

Sl.No	Age	No. of Cases	Percentage
1	Up to 6 years	5	83%
2	More than 6 years	1	17%



Graph. 31: Pulmonary Oedema And Its Relation To Age Group

Pulmonary edema is more common in children less than 6 year of age (83%) than children above 6 year of age (17%)

PRIAPISM

Fig.16: Priapism

8 patients had priapism. Among them, all of them had cold peripheries, 2 patients had altered sensorium, 3 patients developed myocarditis and two patients developed pulmonary oedema. Bawaskar et al noted priapism in 10% of cases and observed it to be one of the important cardiac premonitory sign.

ECG

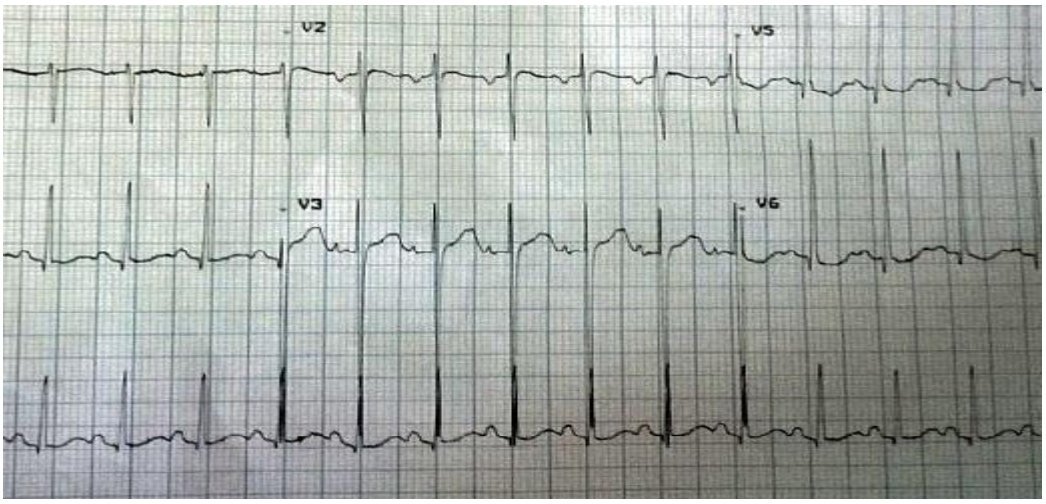


Fig.17: ECG Showing ST elevation

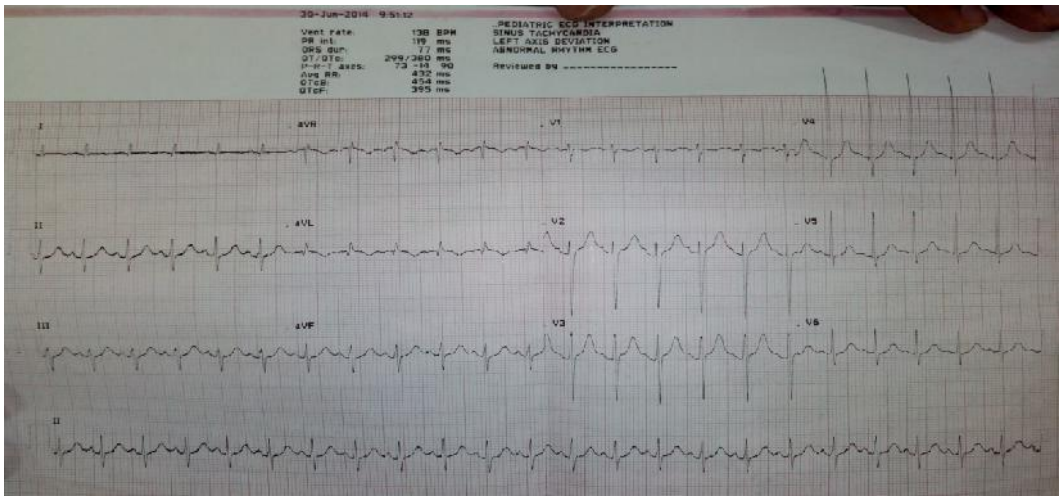


Fig.18: ECG Showing Tall T waves and sinus tachycardia

ECGs with sinus tachycardia, ST elevation and Tall T waves are shown above. Those with ECG findings suggestive of early myocardial infarction like pattern are found to have higher incidence of congestive cardiac failure and

peripheral vascular collapse. Patients with ECG of low voltage complexes throughout the recording and left anterior hemi block indicate poor prognosis.

PULMONARY OEDEMA

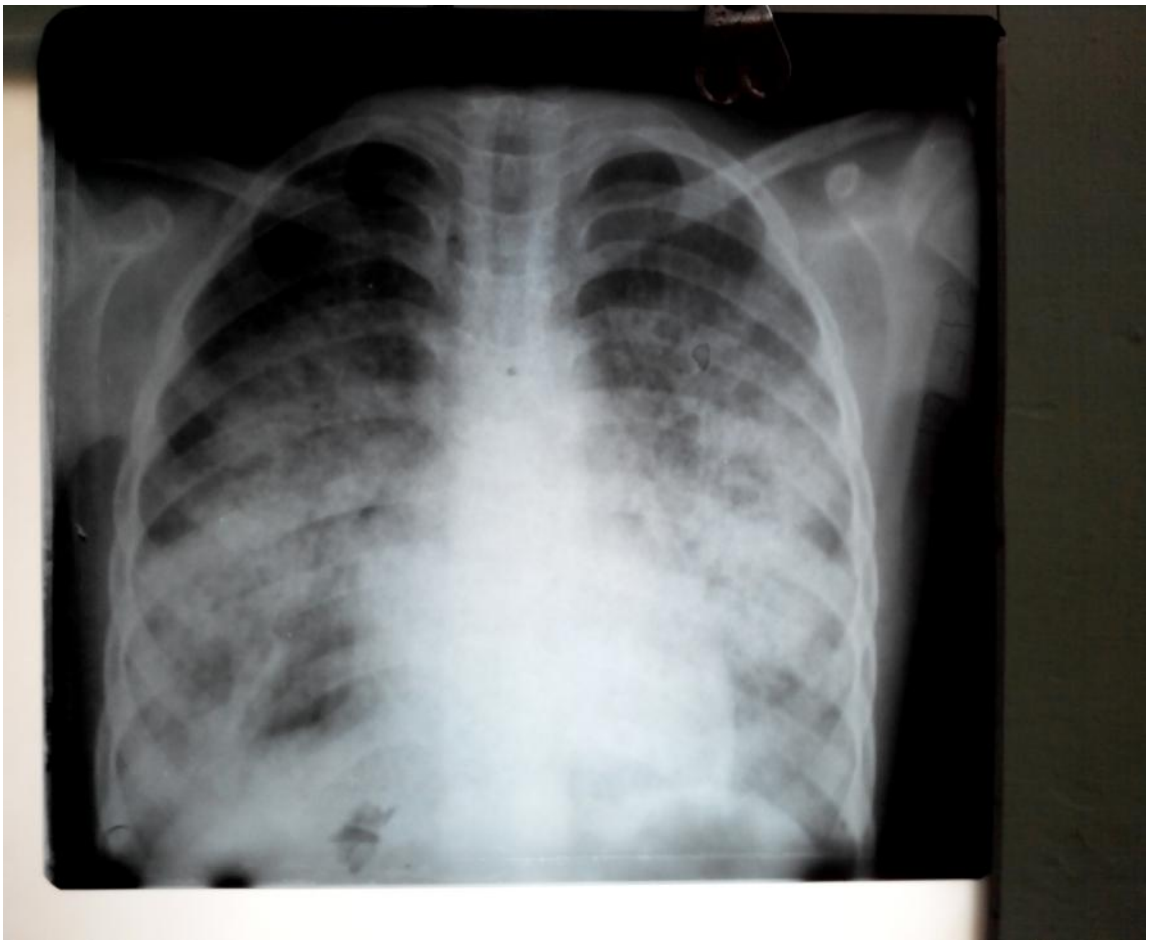


Fig. 19:Chest Radiograph showing Pulmonary oedema

Pulmonary oedema is a life threatening time limiting emergency, often fatal and needs rapid intervention.

DISCUSSION

Scorpion sting is an acute life threatening, time limiting medical emergency of villages. Numerous envenomations go unreported and the true incidence is not known[2.] Case fatality rates vary widely among different regions from 3-22%[2] and over the years with improvement in management protocols, there has been a dramatic reduction in mortality.

We studied 141 cases of scorpion sting, admitted to our hospital from January 2014 to July 2014 and our observations are discussed below.

Age distribution:

The proportion of cases in less than one year, 1-3 year, 4-6 year, 7-12 year age groups were 6%, 35%, 25% and 34% respectively. Mahadevan S in 1981, reported a series of 100 cases of scorpion sting in children and reported a similar age distribution[35]. Children between 6-12 years of age are more exploratory and tend to wander outside homes in the darkness and hence are more susceptible to stings[4].

Sex distribution:

There was a male preponderance in cases studied by us. This has also been noted in the past by various authors[3,35]. This could be because boys tend to

be more exploratory and wander outside. Scorpion stings, much like snake bites are occupational hazards for the rural population[65].

Urban and rural area:

Majority of cases [74] were from rural areas. Scorpion sting is mainly a rural emergency[2]. Children from rural areas are at highest risk for accidental contact with scorpions.

Place of sting:

The proportion of scorpion stings sustained indoor was more than to that sustained outdoor. Rural male children are more often involved in agricultural activities and hence are more at risk of accidental contacts with scorpions in the fields.

Housing:

The incidence of scorpion sting is higher in children living in kutcha houses. Kutcha houses have mud floors and walls and thatched roofs. Scorpions inhabit the crevices and underground burrows in dwellings and these houses provide a safe heaven for them. In contrast, pakka houses with tiled floors and cemented walls and roofs are safer[31].

Socioeconomic status:

A higher incidence of sting was noted in lower socioeconomic status. The high incidence in this group is due to the type of housing and farms nearby their houses.

Time of sting:

Night time stings were more common. This is similar to earlier studies which showed a preponderance of stings sustained during night time due to nocturnal habit of the scorpion[1,2].

Site of sting:

Although any part of the body can be exposed to sting, in 91% of cases in our study, the sting was sustained on the extremities. This is comparable to many studies in the past which showed an increased incidence of stings on the peripheries of around 80%[30,32.]

Signs and symptoms:

Pain at the sting site was the commonest complaint and was invariably present in most of the cases. The high incidence of pain was also noted in previous studies[4,31]. Profuse sweating was noted in 62% of cases. Vomit and excessive salivation in 18% and 29% of cases respectively. Local swelling was noted only in 9% of cases. Cold peripheries was noted in 77% of cases.

8 patients had priapism. Among them, all of them had cold peripheries, 2 patients had altered sensorium, 3 patients developed myocarditis and two patients developed pulmonary oedema. Bawaskar et al noted priapism in 10% of cases and observed it to be one of the important cardiac premonitory sign[36].

5 patients presented with altered sensorium. Among them, 3 patients developed myocarditis, 2 patients developed pulmonary oedema and one patient expired. Among them, 4 patients (80%) were less than 6 year of age and 1 patient (20%) was more than 6 year age. Thus altered sensorium was more common in young children.

12 patients had myocarditis. Among them, 10 patients (83%) were less than four years of age and 2 patients (17%) were more than four year of age. Thus myocarditis is more common in young children.

6 patients had pulmonary oedema. Among them 5 patients (83%) were less than 6 year of age and 1 patient (17%) was more than 6 year of age. Thus

pulmonary oedema is also more common in young children. The reported incidence of pulmonary oedema secondary to scorpion sting in India is aroung 5%[31,54]. Both cardiogenic and non cardiogenic factors have been implicated in pulmonary oedema secondary to scorpion sting. Amaral CF et al studied six cases of scorpion sting. They demonstrated both reduced left ventricular systolic function and also increased pulmonary capillary permeability in those cases.

60% to 70% of cases presented with " autonomic storm" characterized by cold extremities, tachycardia, hypotension or hypertension. Hypertension was noted in 30% of cases. Incidence of hypertension in scorpion stings in Indian studies varies from 12.6% to 29% and usually seen within 4-8 hours after the sting[31]. Hypotension can occur within 1-2 hours after sting, due to fluid loss and also 4 – 48 hours due to left ventricular dysfunction[2]. Tachycardia was present in 44% of cases and bradycardia in 4% of cases at the time of admission. Bradycardia is an early finding in autonomic storm due to cholinergic over activity and has been reported in 8-15% of cases[31,35,66]

Peripheral circulatory failure was the commonest complication encountered and is a consequence of fluid loss in the initial cholinergic storm and also secondary to myocarditis. High incidence of peripheral circulatory failure, ranging from 56-80% has been noted in various case series in india[31,35,54]. Most of these cases responded well to prazosin, fluid resuscitation and inotropic support. 12 cases (9%) landed up with myocarditis. These cases

had ECG abnormalities in the form of ST inversion or elevation and/or T wave abnormalities. Echocardiogram was done in these cases and it was found to be normal study.

Myocarditis has been known to occur secondary to Indian red scorpion envenomations, with the reported incidence of 22-50%[31,35,54]. It is usually transient and most of the patients recover without significant complications[31,35,54]

Cerebrovascular manifestations following scorpion sting is infrequently encountered in india[2], with a frequency of around 7%, with almost equal prevalence of thrombotic and hemorrhagic stroke[31,35,57].

Complications were encountered more frequently in younger children. Similar findings were observed by Bawaskar.H.S et al[4] and Biswal.N. et al[57]. The dose of the venom relative to the weight is obviously higher in younger children, thus rendering them susceptible to more severe envenomation and greater risk of complications[2]. There was no significant difference in the incidence of complications in males and females. Bawaskar.H.S et al have reported increased risk of pulmonary oedema and hypertension in males compared to females[4]. No other data in published literature has reproduced this finding and there is no evidence to suggest that there is a variable effect of the venom on males and females.

Complications were noted less frequently in children who received a dose of prazosin early (<6 hours of sting). This finding is comparable to studies done elsewhere in india, which show that early and effective administration of prazosin significantly reduced the incidence of complications and mortality[1,5,12,52,57]. Prazosin, an alpha adrenoceptor antagonist is a physiological and pharmacological antidote of scorpion venom[12]. Cardiovascular morbidity and mortality depends on the time interval between sting and administration of prazosin[12]. A consensus regarding early use of prazosin has since been established.

Mortality:

Out of 141 cases, one patient expired (0.07%). Death occurred in a younger child and had myocarditis, cardiogenic shock, encephalopathy, massive pulmonary oedema. The victim could not be resuscitated inspite of fluid boluses, oxygen , maximum inotropic support and mechanical ventilation.

The mortality due to scorpion sting has dramatically declined over the years from 68% to less than 1%[2,31,35]. Early administration of prazosin and improved management practices are the important factors responsible for the decline[12]. Deaths due to scorpion sting occur mainly due to massive pulmonary oedema, CCF with cardiogenic shock[31,35,54].

SUMMARY

Scorpion is a common emergency encountered in our pediatric emergency service. The clinical data of 141 pediatric cases of scorpion sting admitted in government raja mirasdhar hospital, thanjavur were analysed. The current literature to scorpion sting, its presentation and complications are reviewed. The summary is given below

1. Scorpion sting is a common life threatening emergency in our area

2. Maximum number of cases were in the age group of 1-3 years and 7-12 years

3. Scorpion stings were more common in males compared to females.

4. Majority of cases were from rural areas

5. Majority of stings were sustained in kutcha house.

6. Majority of children were from lower socioeconomic status.

7. Stings sustained indoor were more than outdoors

8. Stings were mostly sustained during the night time.

9. Stings were mostly over the extremities.

10. Pain at the sting site was noted in majority of cases.

11. Peripheral circulatory failure was found in 77% of cases

12. Myocarditis was found in 9% of cases.

13. Pulmonary oedema was found in 4% of cases.

14. Complication were more frequently noted in younger children.

15. Duration of hospital stay ranged from 2-7 days according to severity of envenomation.

16. Majority of cases recovered without any sequelae.

17. During the study period, one death occurred due to myocarditis and pulmonary oedema. Case fatality rate was less than one percent.

CONCLUSION

Scorpions have been known to man since time immemorial and have a significant presence in mythology and human history. Scorpion sting, once considered just a painful nuisance have now got the attention and care that they deserve.

The relentless invasion of human beings in to the habits of scorpions has brought us in direct conflict with these arachnids. Scorpions stings are occupational hazard for children from rural areas, employed in dry agricultural areas. They constitute a significant public health problem in many underdeveloped countries.

In india cardiovascular complications are most common and life threatening. However, anticipation and close monitoring for the other uncommon complications is critical for effective management. Parazosin has revolutionized the management of scorpion sting envenomation. Administration of prazosin as early as possible, is probably the single most effective intervention for preventing complications.

Early and effective prazosin therapy, good supportive care, close monitoring and management of complications can limit the resulting morbidity and mortality significantly. The role of scorpion antivenom still remains controversial.

public awareness regarding measures for prevention of sting and physician readiness to combat this common emergency can go a long way in preventing the devastating effects of this condition.

BIBLIOGRAPHY

1. Clark RF. Scorpion Envenomation. In: Clinical Toxicology. Ford MD, Delaney KA, Ling LJ, Erickson J, edt., 1st Edn,. W.B. Saunders company; Pennsylvania: 2004,p.290-93
2. Mahadevan S. Scorpion Sting. Indian Pediatr 2000; 37: 504-14
3. Cheng D, Dattaro JA, Yakobi R. Scorpion sting.Cited on 2005 June 23;24 screens: Available from : URL:http://www.emedicine.com/med/topic2081.htm. Accessed August 28, 2007.
4. Bawaskar HS, Bawaskar PH. Indian Red Scorpion Envenoming. Indian J Pediatr 1998; 65:383-91
5. Bawaskar HS, Bawaskar PH. Clinical profile of severe scorpion envenomation in children at rural setting. Indian Paediatr 2003; 40:1072-1076
6. Rimza MA, Zimmerman DR, Bergeson PS. Scorpion Envenomation. Pediatr 1980;66(2):298-302.
7. Warrel DA. Animal Poisons. In: Manson's Tropical Diseases. Bell DR edt., 19th edn.,Bailliere, Tindall and Cassel publishers; Suffolk:1987,p. 889-90
8. Wirtz RA, Azad AF. Injurious Arthropods. In: Hunter's Tropical Medicine.Strickland GT edt., 7th Edn., W.B. Saunder's Company; Philadelphia: 1991.p.907-09.

9. Bawaskar HS. Scorpion sting. In: API Textbook of Medicine. Shah SN edt., 7th edn., The Association Of Physicians Of India; Mumbai:2003,p.1282-84.

10. Basu A, Gomes A, Aparna Gomes, Dasgupta SC, Lahiri SC. Histamine, 5-HT and Hyaluronidase in the venom of the scorpion Lychaslarviforms (Pock). Indian J Med Res 1990; 92:371-73.

11. Joshi SR, Sapatnekar SM. Stings and Hopes :Toxinomics and Autonomic storm in the Indian Red Scorpion (Mesobuthustamulusconcanesispocock) J Assoc Physicians India 2007;55:11-13.

12. Bawaskar HS. Management of severe scorpion sting at Rural settings: What is the role of scorpion antivenom? J.VenomAnim Toxins incl Trop Dis 2005; 11(1):3-7

13. Bawaskar HS, Bawaskar PH. Management of the cardiovascular manifestations of poisoning by the Indian red scorpion (Mesobuthustamulus). Br Heart J 1992;68:478-80.

14. Renin And Angiotensin levels and Hypertension following envenomation in humans by the yellow scorpion Leiurusquinquestriatus. Gueron M, Ilia R, Shahak F, Sofer S. Toxicon 1992;30(7):765-7

15. Balasubramaniam P, Murthy KRK. Liver Glycogen Depletion in Acute Myocarditis produced by Scorpion Venom (Buthustamulus). Indian Heart J 1984;36(2):101-03

16. Radhakrishnamurthy K, Billimoria FR, Khopkar M, Dave KN. Acute hyperglycemia and hyperkalemia in Acute Myocarditis produced by Scorpion (Buthustamulus) venom injection in dogs. Indian Heart J 1986; 38(1): 71-74

17. Radhakrishnamurthy K, Vakil AE, Yeolekar ME, Vakil YE. Reversal of metabolic and electrocardiographic changes induced by Indian red scorpion (Buthustamulus) venom by administration of insulin, alpha blocker and sodium bicarbonate. Indian J Med Res 1988;88:450-57

18. Radhakrishnamurthy K, Anit AG, Dave BN, Billimoria FR. Erythrocyte Na^+-K^+ ATPase activity inhibition and increased in red cell fragility in experimental myocarditis produced by Indian red scorpion venom. Indian J Med Res 1988;88:536-540.

19. Sitadevi C, Reddy CN, Lakshmidevi S, Subrahmanyam YR, Bhatt HV, Suvarnakumari G, Prasantha Murthy D, Reddy CRRM. Defibrination Syndrome due to Scorpion Venom Poisoning. Br Med J 1970;1:345-47.

20. Radhakrishnamurthy K, Zolfagharian H, Medh JD, Kudalkar JA, Yeolekar ME, Pandit SP, Khopkar M, Dare KN, Billimoria FR. Disseminated intravascular coagulation and disturbances in carbohydrate and fat metabolism in acute myocarditis produced by scorpion (Buthustamulus) venom. Indian J Med Res 1988;87:318-325.

21. Udaykumar N, Rajendran C, Srinivasan AV. Cerebrovascular manifestations in Scorpion sting. A case series. Indian J Med Sci 2006;60.241-244.

22. Chelliah T, Rajendran M, Daniel MK, Sahayam JLJ. Stroke following scorpion sting. J Assoc Physicians India 1993; 41(5):310
23. Ganeshan TK, Venkataraman S. Generalized tonic clonic fits following scorpion sting. Neurol India 1989;37(2):9
24. Gupta PR, Gupta SS, Dwivedi NC, Poddar SK. Stroke following scorpion sting bite. Neurol India 1989;37(2):17
25. Romero NO, Herande TJM. Cerebral edema due to scorpion sting. A two case sting report. J Venom Anim Toxins incl Trop Dis 2005;11(4):594-600.
26. Chada JS, Leviav A. Hemolysis, Renal Failure and Local Necrosis following scorpion sting. J Am Med Assoc 1979;241(10):1038
27. Bartholomew C. Acute scorpion pancreatitis in Trinidad. Br Med J 1970;1:666-668
28. Magalhaes MM, Pereira MF, Amaral CF. Serum levels of Cytokines in patients envenomed by Tityusserrulatus scorpion sting. Toxicon 1999;37(8):1155-64.
29. Radhakrishnamurthy K, Joshi AG. Reduced insulin secretion in acute myocarditis produced by scorpion (Buthustamulus) venom injection in rabbits. Indian Heart J 1986; 38(6):467-469
30. Mahaba HMA. Scorpion Sting Syndrome : Epidemiology, clinical presentation and management of 2240 cases. Eastern Mediterranean Health J 1997;3(1):82-89
31. Rajarajeshwari G, Sivapraksam S, Vishwanathan J. Morbidity and Mortality pattern in Scorpion Stings. J.Indian Med Assoc 1979;73(7&8):123-126

32. Dittrich K, Power AP, Smith NA, Scorpion sting syndrome- A Ten Year Experience. Ann Saudi Med 1995; 15(2): 148-155

33. Mahadevan S. Scorpion Sting. In: Principles of Pediatric and Neonatal Emergencies. Sachdev HPS, Choudhury P, Bagga A, Chugh K, Ramji S, Puri RK edt.,2nd edn., Jaypee Brothers; New Delhi: 2003,p.409-15

34. Paresthesia in envenomation by the scorpion Leiurus quinquestriatus. Boqomolski- Yahalom V, Amitai Y, Stalnikowicz R. J Toxicolclintoxicol 1995;33(1):79-82.

35. Mahadevan S, Choudhary P, Puri RK, Srinivasan S. Scorpion envenomation and the role of lytic cocktail in its management. Indian J Pediatr 1981;48:757-761

36. Bawaskar HS. Diagnostic cardiac premonitory signs and symptoms of red scorpion sting. Lancet 1982;1(8271):552-4

37. Rao R, Ramaswamy VN. Toxic Myocarditis with resultant arrhythmias due to scorpion sting. J Assoc Physicians India 1981;29:481-483.

38. Poonking T. Myocarditis following scorpion sting. Br Med J 1963;1(5327):374-7.

39. Karnad DR. Hemodynamic patterns in patients with scorpion envenomation. Heart 1998;79(5):485-9.

40. Santhanakrishnan BR, Gajalakshmi BS. Pathogenesis of cardiovascular complications in children following scorpion envenoming. Ann Trop Pediatr 1986;6(2):117-121

41. Bhandari UK, Tripathi A, Sharma S, Pandey R. Scorpion sting envenomation presenting with Pulmonary edema in adults : A report of seven cases from Nepal. Indian J Med Sci 2006;60:19-23.
42. Rahav G, Weiss AT. Scorpion Sting- Induced Pulmonary Edema. Chest 1990;97:1478-80.
43. Amaral CFS, Rezende NAD, Friere-Mara L. Acute Pulmonary Edema after TityusSerrulatus scorpion sting in children. Am J Cardiol 1992;71:242-45. 44. Bawaskar HS. Scorpion sting and cardiovascular complications. Indian Heart J 1977;29(4):228.
44. Bawaskar HS. Scorpion sting and cardiovascular complications. Indian Heart J 1977;29(4):228.
45. Gadwalkar SR, Bushan S, Pramod K, Gowda C, Kumar PM. Bilateral cerebellar infarction: A rare complication of Scorpion sting. J Assoc Physicians India 2006;54(4):581-3
46. Solanki SV, Kothari UR, Dave DB. Hemiplegia following scorpion sting. J Indian Med Assoc 1981;77(9&10):155-56
47. Malhotra KK, Mirdehghan CM, Tandon HD. Acute Renal failure following scorpion sting. Am J Trop Med Hyg 1978;27(3):623-6.
48. Naqvi R, Naqvi, Akhtar F, Rizvi A. Acute Renal Failure developing after a scorpion sting. Br J Urol 1998;82(2):295

49. Steen CJ, Carbonaro PA, Schwartz RA. Arthropods in Dermatology. J Am Acad Dermatol 2004;50(6):819-42.

50. Natu VS, Murthy RKK, Deodhar KP. Efficacy of species specific Anti-scorpion Venom Serum (AScVS) against severe, serious scorpion sting (Mesobuthu tamulusconcanensispocock)- An Experience from Rural Hospital in western Maharashtra. J Assoc Physicians India 2006;54(3):283-287.

51. Roantree WB. Scorpion Stings. Br Med J 1961;5:1395.

52. Bawaskar HS, Bawaskar PH. Prazosin in the management of cardiovascular manifestations of scorpion sting. Lancet 1986;1(8479):510-11

53. Linden CH, Burns MJ. Scorpion stings. In : Harrison's principles of internal medicine. Kasper DL, Fauci AS, Longo DL, Braunwald E, Hauser SL, Jameson JL edt., 16thedn.,McGraw - Hill Companies;Newyork:2005,p.2604

54. Santhanakrishnan BR. Scorpion Sting. IndPediatr 2000;37:1154-57.

55. Miller RR, Awan NA, Maxwell KS, Mason DT. Sustained Reduction of Cardiac impedance and preload in congestive heart failure with antihypertensive vasodilatorprazosin. N Eng. J Med 1977;297(6):303-7

56. Bawaskar HS, Bawaskar PH. Severe envenoming by the Indian red scorpion Mesobuthustamulus: The use of prazosin therapy. Q J Med 1996;89:701-4

57. Biswal N, Bashir Rani A, MurmuUday C, Mathai B, Balachander J, Srinivasan S. Outcome of scorpion sting envenomation after a protocol guided therapy. Indian J Pediatr 2006;73:577-82

58. Krishnan A, Sonawane RV, Karnad DR. Captopril in the treatment ofcardiovascular manifestations of Indian red scorpion (Mesobuthustamulus concanesispocock) envenomation. J Assoc Physicians India 2007;55:22-26.

59. Sofer S, Shahak E, Gueron M. Scorpion envenomation and antivenom therapy. J Pediatr 1994;124:973-8.

60. Murugesan S, Radhakrishnamurthy K, Noronha OPD, Samuel AM. 99mTc-scorpion venom: labeling, biodistribution and scintigraphy. J Venom Anim Toxins 1999;5:35-46.

61. Abroug F, ElAtrous S, Nouira S, Haguiga H, Touzi N, Bouchoucha S. Serotherapy in Scorpion envenomation: a randomized controlled trial. Lancet 1999;354:906-909.

62. Sundararaman T, Olithselvan M, Sethuraman KR, Narayan KA. Scorpion Envenomation as a Risk Factor for development of Dilated Cardiomyopathy. J Assoc Physicians India 1999;47(11):1050.

63. Adiguzel S, Ozkan O, Inceoglu B, Epidemiological and clinical characteristics of scorpionism in children in Sanliuefa, Turkey. Toxicon 2007; 49(6):875-80

64. Karthale S, Khan A, Lokhandwala Y. Scorpion- stings the limb and stuns the heart? J Assoc Physicians India 1999;47(11):1045-46.

65. Kulkarni ML, Anees S. Snake venom poisoning: experience with 633 cases. Indian Pediatr 1994;31(10):1239-43.

66. Singh DS, Bisht DB, Sukumar G, Muralidhar K. Scorpion stings in adult South Indians at Pondicherry. J Indian M A 1979;72(10):234-37.

PROFORMA

Name : Age : Sex :

Address : Date and time of admission :

D.O.A / D :

Occupation and income of parents : Rural/urban :

Final diagnosis :

Condition on discharge : cured/expired/Sequelae

Informant : Reliable/Unreliable

HOPI :

1. History of scorpion sting:
    - Site of sting
    - Time of sting: day/night
    - Place of sting: outdoor/indoor
    - Type of scorpion: red/black/not identified
    - Time lag between sting and prazosin

2. Local symptoms;

    Pain: present/absent

    Site

    Radiation

    Severity: mild/moderate/severe.

    Relief of pain after local application/ systemic administration of medicine

- Swelling: present absent

3. General symptoms : present absent

- Restlessness
- Vomiting
- Profuse perspiration
- Excessive salivation
- Fever, chills, rigors
- Chest pain
- Hurried respiration

- Pain abdomen: Site

  Onset

  Duration

- Haemetemesis/ malena
- H/o loss of consciousness
- Convulsions (general/focal)
- Micturition : Normal

  Oliguria

  Haematuria

PAST HISTORY :

Past history of scorpion sting :

No. of times:

Nature:

Treatment taken:

Pre-existing disease :

RHD

CHD
HTN

Renal disease

CNS disease

BIRTH HISTORY :

Antenatal

Natal

Postnatal

DEVELOPMENTAL HISTORY : normal/delayed/regression

IMMUNISATION HISTORY : Fully/ partially/ up to date/ not immunized.

DIETIC HISTORY :

FAMILY HISTORY :

SOCIO ECONOMIC STATUS : Income -

Housing - kutcha/pakka

GENERAL PHYSICAL EXAMINATION :
Anthropometry :

Wt: expected: (%)

Ht: expected: (%)

HC: expected

Pulse rate : normal/ bradycardia/ tachycardia

RR : normal/ bradypnea/ tachypnea

Temp : normal/ increased/ decreased

BP : normal/ hypertension/ hypotension

Extremities : warm/cold

LOCAL EXAMINATION :

- Site and situation of sting
- Sting Mark Present/ absent
- Tenderness Present/ absent

SYSTEMIC EXAMINATION :

Cardiovascular system :

- Pulse: Rate

  Rhythm

  Character

  Volume

- Peripheral pulses : Present/absent
- JVP Normal/ raised
- BP

- Inspection

- Palpation

- Percussion

- Auscultation

RESPIRATORY SYSTEM :

PER-ABDOMEN EXAMINATION :

CENTRAL NERVOUS SYSTEM :

INVESTIGATIONS :

Blood urea / serum creatinine :

ECG :

X-ray chest :

Echo cardiography :

TREATMENT :

CONDITION ON DISCHARGE :

DURATION OF STAY IN HOSPITAL :

Master sheet

Sl.No	Name	Age	Gender	IP.No	Urban Or Rural	Housing	SES	O/I	Day Or Night	Site	Pain	Salivation	Sweat	Vomit	Swelling	Alt. sensorium	Heart rate	Respiratory Rate	BP	Cold periphery	Breath. diff	Myocarditis	Pulm. Edama	Sting Prazosin	Interval Prazosin	Prazosin doses	Time - Rev - Aut storm	Inotrope	Duration of stay	Priapism	Prognosis
1	Hariprasath	4	M	290528	R	P	3	O	D	E	✓	✓	✓	X	X	X	T	N	N	✓	X	X	X	4	1	6	X	2	X	Recovered
2	Pradeep	1.5	M	290557	R	K	2	I	N	E	✓	✓	✓	X	X	X	T	N	N	✓	X	X	X	3	1	5	X	2	X	Recovered
3	Allitha	6	F	290632	R	K	2	O	D	E	✓	✓	✓	✓	X	✓	T	T	L	✓	✓	✓	X	4	2	10	✓	6	X	Recovered
4	Ramya	1	F	291257	R	K	1	O	D	E	✓	X	X	X	X	X	N	N	N	X	X	X	X	X	X	X	X	X	2	X	Recovered
5	Jayasri	1	F	291274	U	P	3	I	N	E	✓	X	X	X	✓	X	N	N	N	✓	X	X	X	0.45	2	12	X	2	X	Recovered
6	Giriprasath	3.5	M	291526	R	P	3	O	D	E	✓	X	X	X	X	X	N	N	N	X	X	X	X	X	X	X	X	X	1	X	Recovered
7	Kalai	3	M	291512	R	K	1	I	N	E	X	✓	✓	✓	X	X	N	N	H	✓	X	X	X	2	2	10	X	2	X	Recovered
8	Abinaya	3	F	291518	U	K	2	I	N	NECK	✓	X	✓	X	X	X	T	N	N	✓	X	X	X	2	2	11	X	2	X	Recovered
9	Vishnupriyan	2	M	291702	R	P	4	O	D	E	✓	X	X	X	X	X	T	N	N	✓	X	X	X	1	2	9	X	2	X	Recovered
10	Srikanth	10	M	291837	R	K	2	I	D	E	X	X	✓	X	X	X	N	N	N	✓	X	X	X	3	1	6	X	2	X	Recovered
11	Senthamilselvan	6	M	292685	U	K	2	I	D	E	✓	X	X	X	X	X	N	N	N	X	X	X	X	X	X	X	X	1	X	Recovered
12	Cholan	1.5	M	292416	R	K	2	I	N	E	✓	X	✓	X	X	X	T	N	N	✓	X	X	X	1	2	11	X	2	✓	Recovered
13	Arivazhalan	12	M	292410	R	K	2	O	D	E	✓	X	✓	X	X	X	T	N	N	✓	X	X	X	4	1	7	X	2	X	Recovered
14	Anushka	4	F	292617	U	K	1	O	D	E	✓	X	X	X	✓	X	T	N	N	✓	X	X	X	3	2	10	X	2	X	Recovered
15	Abarna	4	F	292665	U	P	4	I	N	NECK	✓	✓	✓	✓	X	X	T	N	N	✓	✓	✓	X	2	1	5	X	2	X	Recovered
16	Abinash	3	M	292486	U	K	1	O	D	E	✓	X	✓	✓	✓	X	N	N	N	✓	X	X	X	3	2	12	X	3	X	Recovered
17	Selvakumar	12	M	292792	R	K	2	I	N	HEAD	✓	X	✓	✓	X	X	N	N	H	✓	X	X	X	2.3	1	5	X	2	X	Recovered

18	Sathiyaseelan	11	M	290509	R	K	2	I	N	E	✓	✓	✓	✓	✓	✓	T	T	L	✓	✓	X	✓	7	3	20	✓	6	✓	Recovered
19	Sneka	11	F	293184	R	P	4	O	D	E	X	X	X	X	X	X	N	N	N	X	X	X	X	X	X	X	X	1	X	Recovered
20	Deepika	5	F	293792	R	K	2	O	D	E	✓	X	X	X	X	X	N	N	N	X	X	X	X	X	X	X	X	2	X	Recovered
21	Kirthish	1.5	M	293816	R	P	3	O	N	E	✓	X	X	X	X	X	N	N	N	X	X	X	X	X	X	X	X	2	X	Recovered
22	Gopika	3	F	294000	U	P	3	O	D	E	✓	X	✓	✓	X	X	N	N	N	✓	X	X	X	4	1	7	X	2	X	Recovered
23	Govindhasami	12	M	294013	R	K	2	I	N	E	✓	X	✓	X	X	X	T	N	N	✓	X	X	X	6	2	14	X	2	X	Recovered
24	Keerthiga	8m	F	294079	R	K	1	I	D	E	✓	X	X	X	X	X	N	N	N	X	X	X	X	X	X	X	X	1	X	Recovered
25	Subhashini	5	M	294381	R	P	3	I	N	E	✓	X	✓	X	X	X	T	N	N	✓	X	X	X	3	2	11	X	2	X	Recovered
26	Venkatesan	6m	M	294831	R	K	1	I	N	E	✓	X	✓	X	X	X	N	N	H	✓	X	X	X	3	1	6	X	2	X	Recovered
27	Achisivasri	1.5	F	294897	R	K	1	O	D	E	✓	✓	✓	✓	X	X	T	N	H	✓	X	X	X	6	2	14	X	2	X	Recovered
28	Subitha	1.5	F	294975	U	P	3	O	D	E	✓	X	✓	X	✓	X	N	N	H	✓	X	X	X	2	1	5	X	2	X	Recovered
29	Kanishka	6	F	294091	R	P	3	O	N	E	✓	X	✓	X	X	X	T	N	N	✓	X	X	X	3	1	8	X	2	X	Recovered
30	Kavya	8	F	295107	U	P	4	O	D	HEAD	✓	X	✓	X	X	X	T	N	H	✓	X	X	X	2	2	12	X	2	X	Recovered
31	Sivavishnu	10m	M	295206	R	K	1	O	D	E	✓	X	✓	✓	✓	X	T	N	N	✓	X	X	X	1	3	13	X	2	X	Recovered
32	Austinsmith	10	M	295309	U	P	3	O	D	E	✓	X	✓	X	X	X	N	N	H	✓	X	X	X	3	1	6	X	2	X	Recovered
33	Oviya	3	F	295558	R	K	2	O	D	E	X	✓	✓	✓	X	X	T	N	N	✓	X	X	X	1	3	13	X	2	X	Recovered
34	Manikandan	1	M	295477	R	K	2	O	D	E	✓	X	X	X	X	X	N	N	N	X	X	X	X	X	X	X	X	1	X	Recovered
35	Vishnu	11	M	295828	R	K	1	I	N	ABD	✓	X	X	X	X	X	N	N	N	X	X	X	X	X	X	X	X	2	X	Recovered
36	Vinayakam	5	M	295827	U	P	3	I	N	E	✓	X	✓	X	X	X	N	N	H	✓	X	X	X	2	1	5	X	2	X	Recovered
37	Kanishka	8	F	295803	R	P	3	O	N	E	✓	X	✓	X	X	X	T	N	N	✓	X	X	X	0.5	1	3	X	2	X	Recovered
38	MahalaXami	9	F	295688	R	K	2	I	N	E	X	✓	✓	X	X	X	T	N	H	✓	X	X	X	3	2	13	X	2	X	Recovered
39	Arthi	12	F	295946	U	P	3	O	N	E	✓	X	X	X	X	X	N	N	N	✓	X	X	X	2	1	5	X	2	X	Recovered
40	Adhithya	6m	M	295512	R	K	1	I	N	E	✓	✓	✓	X	X	X	T	N	H	✓	✓	✓	X	1.5	3	15	✓	6	✓	Recovered
41	Ashwin	6m	M	296674	R	K	1	O	N	E	✓	X	✓	X	X	X	N	N	N	✓	X	X	X	3	1	6	X	2	X	Recovered
42	Ajithkumar	12	M	295680	U	K	2	O	D	E	✓	X	✓	X	X	X	T	N	N	✓	✓	✓	X	8	4	32	✓	3	X	Recovered
43	Abinash	7	M	296418	R	K	1	I	N	HEAD	✓	X	✓	✓	X	X	N	N	H	✓	X	X	X	2	1	5	X	2	X	Recovered
44	Harini	1	F	296332	U	P	3	O	N	E	✓	X	X	X	X	X	N	N	N	X	X	X	X	X	X	X	X	2	X	Recovered
45	Praveen	11	M	296293	R	K	2	O	D	FACE	✓	X	✓	X	✓	X	T	N	N	✓	X	X	X	6	2	14	X	2	X	Recovered
46	Vigneshwaran	10m	M	297300	R	K	2	I	N	E	✓	✓	✓	X	X	X	T	T	N	✓	X	X	X	2	3	17	X	2	✓	Recovered
47	Kabilan	7	M	297720	R	K	1	I	N	E	✓	X	✓	X	X	X	N	N	N	✓	X	X	X	3	2	13	X	2	X	Recovered
48	Sruthi	1	M	297449	R	K	1	O	N	E	X	X	✓	X	X	X	T	N	H	✓	X	X	X	1	2	9	X	2	X	Recovered

49	Sathish	9	M	297350	R	K	2	I	D	E	✓	X	X	X	X	X	N	N	N	X	X	X	X	X	X	X	2	X	Recovered
50	Abirami	11	F	300749	R	K	1	O	N	E	✓	X	✓	X	X	X	T	N	N	✓	X	X	X	2	1	5	X	2	X	Recovered
51	Muthupandi	1.5	M	298825	R	K	1	I	N	E	✓	X	✓	X	X	X	T	N	N	✓	X	X	X	7	3	20	X	2	X	Recovered
52	Rishika	3	F	299105	U	P	3	O	N	E	✓	X	X	X	X	X	N	N	N	✓	X	X	X	2	2	12	X	2	X	Recovered
53	Vishvarai	1.5	M	299143	U	P	3	I	D	ABD	✓	X	X	X	X	X	N	N	N	✓	X	X	X	3	2	13	X	2	X	Recovered
54	Sivakailash	2	M	299343	R	K	1	O	D	E	✓	X	X	X	X	X	N	N	N	X	X	X	X	X	X	X	X	2	X	Recovered
55	Kirubasri	4	F	299873	R	K	2	O	D	E	✓	✓	✓	✓	✓	✓	T	T	L	✓	✓	✓	✓	6	3	20	X	2	X	Death
56	Buvanasri	5	F	299892	R	K	1	O	N	E	✓	X	X	X	X	X	N	N	N	X	X	X	X	X	X	X	X	2	X	Recovered
57	Santhosh	6	M	301107	R	K	2	I	D	E	✓	✓	✓	X	✓	X	N	N	N	✓	X	X	X	3	2	14	X	2	X	Recovered
58	Sivasankar	3	M	301103	U	P	3	O	D	E	✓	X	✓	X	X	X	T	N	N	✓	X	X	X	1.5	1	5	X	2	X	Recovered
59	Prithviraj	1	M	301036	R	K	1	O	D	E	✓	X	✓	X	X	X	N	N	N	✓	X	X	X	4	3	18	X	2	X	Recovered
60	Varnika	1	F	301023	R	K	1	I	D	E	X	✓	✓	X	X	X	N	N	N	✓	✓	✓	✓	12	3	25	✓	5	X	Recovered
61	Surthika	2	F	300028	U	P	3	O	D	NECK	✓	X	✓	✓	X	X	T	N	H	✓	✓	✓	✓	4	3	16	✓	6	X	Recovered
62	Velu	10	M	300307	R	K	1	I	N	E	✓	X	✓	X	X	X	T	N	N	✓	X	X	X	2	1	5	X	2	X	Recovered
63	Mahisha	5	F	300888	R	K	1	I	D	E	✓	X	✓	X	X	X	N	N	L	✓	X	X	X	2	1	5	X	2	X	Recovered
64	Kishore	4	M	300887	R	K	1	I	N	E	✓	✓	✓	✓	X	X	N	N	N	✓	X	X	X	4	2	14	X	2	X	Recovered
65	Jagadeesh	2	M	300904	R	K	2	I	N	E	✓	X	X	X	X	X	N	N	N	✓	X	X	X	4	1	7	X	2	X	Recovered
66	Jagan	2.5	M	300029	R	K	2	I	N	E	✓	X	✓	X	X	X	N	N	N	X	X	X	X	X	X	X	X	2	X	Recovered
67	Dhivya	9	F	300105	R	K	1	I	N	E	✓	X	✓	X	X	X	N	N	N	✓	X	X	X	1	1	4	X	2	X	Recovered
68	Sangamithra	1.5	F	296977	U	P	3	I	D	E	✓	X	✓	X	X	X	N	N	N	✓	X	X	X	2	1	5	X	2	X	Recovered
69	Monisha	4	F	296275	U	P	3	O	N	E	✓	X	✓	X	X	X	T	N	H	✓	X	X	X	2	1	5	X	2	X	Recovered
70	Elanchelian	6	M	291271	R	K	2	I	N	E	✓	X	X	X	X	X	T	N	N	✓	X	X	X	3	2	13	X	2	X	Recovered
71	Yuvasri	1	F	297264	U	P	3	O	D	E	✓	X	✓	X	X	X	N	N	N	X	X	X	X	X	X	X	X	2	X	Recovered
72	Perarasu	6	M	295366	U	P	3	I	D	E	✓	X	X	X	X	X	N	N	N	✓	X	X	X	3	2	14	X	2	X	Recovered
73	Sujithkumar	10	M	299907	R	K	1	O	N	E	✓	X	✓	X	X	X	T	N	N	X	X	X	X	X	X	X	X	2	X	Recovered
74	Sivaprakash	5	M	299145	R	K	1	I	N	E	✓	X	X	X	X	X	T	N	N	✓	X	X	X	4	2	14	X	2	X	Recovered
75	Kanishkan	3	F	299097	R	K	2	I	D	E	✓	X	✓	X	X	X	N	N	H	X	X	X	X	X	X	X	X	2	X	Recovered
76	Shanmugam	7	M	298858	R	K	1	O	N	E	✓	X	X	✓	X	X	N	N	N	✓	X	X	X	1	1	4	X	2	X	Recovered
77	Thiruvazhagan	1.5	M	298173	U	P	3	I	N	E	X	X	✓	X	X	X	N	N	H	X	X	X	X	X	X	X	X	2	X	Recovered
78	Ilakiya	1	F	298370	R	K	2	I	D	E	✓	✓	X	X	X	✓	N	N	N	✓	X	X	X	1.5	3	14	X	2	X	Recovered
79	Sanjay	4	M	299352	R	K	1	O	D	E	✓	X	✓	X	X	X	T	N	N	X	X	X	X	X	X	X	X	2	X	Recovered
80	Mohanapriya	10m	F	298181	R	K	1	O	N	E	✓	✓	X	X	X	X	T	N	N	✓	X	X	X	3	2	13	X	2	X	Recovered
81	Abinesh	10	M	298410	R	K	1	I	N	HEAD	✓	X	✓	X	X	X	T	N	N	X	X	X	X	X	X	X	X	2	X	Recovered

82	Podhumponnu	2	F	298332	R	K	2	I	N	E	✓	✓	✓	✓	✓	X	N	N	H	✓	X	X	X	1	1	4	X	2	X	Recovered
83	Madhan	8	M	300429	R	K	1	O	N	E	✓	✓	✓	X	X	X	N	N	N	✓	X	X	X	5	3	19	X	3	X	Recovered
84	Arthigan	2	M	301693	R	P	3	O	D	E	✓	X	X	X	X	X	T	N	H	✓	X	X	X	1.5	1	5	X	2	X	Recovered
85	Sudharsan	5m	M	301951	R	K	2	I	D	E	✓	✓	✓	X	X	X	T	N	L	✓	X	X	X	2	2	12	X	2	X	Recovered
86	Ajith	11	M	302227	R	K	1	I	N	E	✓	X	X	X	X	X	N	N	N	✓	X	X	X	1.5	1	4	X	1	X	Recovered
87	Kanmani	7	F	302296	R	K	2	O	D	E	✓	X	✓	X	X	X	N	N	N	X	X	X	X	X	X	X	X	2	X	Recovered
88	Sudharsan	3	M	302005	R	K	1	I	N	E	✓	X	✓	✓	X	X	T	T	N	✓	✓	✓	✓	13	3	30	✓	5	✓	Recovered
89	Niveditha	4	F	301584	R	K	1	I	N	E	✓	✓	✓	X	X	X	T	N	H	✓	✓	✓	X	1	3	13	✓	8	X	Recovered
90	Kishore	6	M	302472	U	P	3	I	N	E	✓	X	✓	X	X	X	T	N	N	✓	X	X	X	1	1	4	X	2	X	Recovered
91	Thanigaivelan	4	M	302475	U	P	4	I	N	E	✓	✓	✓	✓	X	X	T	N	N	✓	X	X	X	1	2	12	X	2	✓	Recovered
92	Sriviji	11	F	302609	R	K	1	I	N	E	✓	✓	✓	X	X	X	B	N	N	✓	X	X	X	2	1	5	X	2	X	Recovered
93	Bavatharani	2	F	302214	R	K	2	I	N	E	✓	X	✓	X	X	X	T	T	N	✓	✓	✓	✓	1	3	13	✓	7	X	Recovered
94	Priyadharshini	3	F	302750	R	K	2	O	N	E	✓	✓	✓	X	X	X	N	N	H	✓	X	X	X	2	1	5	X	2	X	Recovered
95	Manju	12	F	303037	R	K	2	O	N	E	X	X	X	X	X	X	N	N	N	X	X	X	X	X	X	X	X	1	X	Recovered
96	Arbu	1	M	305975	R	K	1	I	N	E	✓	✓	✓	X	X	X	B	N	H	✓	X	X	X	2	2	12	X	2	X	Recovered
97	Harshmitha	2	F	305805	U	P	4	O	D	E	✓	✓	✓	✓	X	X	T	N	L	✓	X	✓	X	4	3	16	✓	7	X	Recovered
98	Nitish	10	M	301723	R	K	1	I	N	E	✓	X	X	X	X	X	N	N	N	X	X	X	X	X	X	X	X	1	X	Recovered
99	Sureka	12	F	306325	R	K	2	I	N	E	✓	X	✓	X	X	X	T	N	N	✓	X	X	X	1	1	4	X	2	X	Recovered
100	Baru	10	F	306461	R	K	1	I	N	E	✓	✓	✓	X	X	X	N	N	H	✓	X	X	X	3	2	12	X	2	X	Recovered
101	Veera	5	M	306570	R	K	2	I	N	E	✓	X	X	X	X	X	N	N	N	X	X	X	X	X	X	X	X	1	X	Recovered
102	Jegan	11	M	306543	U	P	3	O	D	E	✓	✓	✓	✓	X	X	N	N	H	✓	X	X	X	1	1	4	X	2	X	Recovered
103	Jayasri	4	F	306771	R	K	2	I	N	E	✓	✓	✓	X	X	X	B	N	N	✓	X	X	X	2	1	5	X	2	X	Recovered
104	Varshini	5	F	306816	R	K	1	I	N	E	✓	X	X	X	X	X	N	N	N	X	X	X	X	X	X	X	X	2	X	Recovered
105	Sanjay	5	M	307035	R	K	2	I	N	E	✓	X	X	X	X	X	N	N	N	X	X	X	X	X	X	X	X	2	X	Recovered
106	Sajan	3	M	307735	U	P	3	I	N	E	✓	X	X	X	X	X	N	N	N	X	X	X	X	X	X	X	X	1	X	Recovered
107	Yuvaraj	4	M	307609	R	K	1	I	N	E	✓	X	✓	X	X	X	T	N	N	✓	X	X	X	2	1	4	X	2	X	Recovered
108	Prasanna	10	M	308919	U	K	2	O	D	E	✓	✓	✓	X	X	X	T	N	H	✓	X	X	X	1	1	4	X	2	X	Recovered
109	Akash	1.5	M	308766	R	K	2	I	N	E	✓	✓	✓	X	X	X	T	N	N	✓	X	X	X	2	1	4	X	2	X	Recovered
110	Muthu	6	M	309463	U	P	3	I	N	E	✓	✓	✓	X	✓	X	T	N	H	✓	X	X	X	3	1	5	X	2	X	Recovered
111	Praveen	11	M	309456	R	K	1	I	N	E	✓	X	✓	X	X	X	T	N	N	✓	X	X	X	1.5	1	5	X	2	X	Recovered
112	Dinesh	8	M	310678	R	K	2	I	N	E	✓	X	X	X	X	X	N	N	N	✓	X	X	X	1	1	4	X	2	X	Recovered

113	Gunamoli	1.5	F	310074	R	K	1	O	D	E	✓	X	✓	X	X	X	T	N	H	✓	X	X	X	2	2	13	X	2	X	Recovered
114	Jeevan	2.5	M	310133	R	K	2	O	D	E	✓	✓	✓	X	X	X	N	N	H	✓	X	X	X	3	1	6	X	2	X	Recovered
115	Joyal	5	M	310633	U	P	3	I	D	E	✓	X	✓	X	X	X	N	N	N	✓	X	X	X	2	1	5	X	2	X	Recovered
116	Adhithya	6	M	310500	R	K	2	I	D	E	✓	✓	✓	✓	✓	✓	B	N	N	✓	X	✓	X	2	3	15	✓	6	✓	Recovered
117	Kalaivanan	6	M	310927	R	K	1	I	N	ABD	✓	X	✓	✓	X	X	T	N	N	✓	X	X	X	1	1	4	X	2	X	Recovered
118	Ajay	9	M	310841	R	P	3	I	N	E	✓	X	X	X	X	X	N	N	N	✓	X	X	X	2	1	5	X	2	X	Recovered
119	Nitish	12	M	311054	U	P	3	I	N	E	✓	X	✓	X	X	X	N	N	N	✓	X	X	X	1.5	1	5	X	2	X	Recovered
120	Ranjith	9	M	311227	R	K	1	I	N	E	✓	X	X	X	X	X	T	N	N	✓	X	X	X	2	1	5	X	2	X	Recovered
121	Arunash	9	M	311434	R	K	1	O	D	E	✓	✓	✓	X	X	X	T	N	N	✓	X	X	X	1.5	1	5	X	2	X	Recovered
122	Santhosh	2	M	311362	U	P	3	I	D	E	✓	X	X	X	X	X	N	N	N	X	X	X	X	X	X	X	X	1	X	Recovered
123	Dharanisri	5	F	311439	R	K	2	I	D	E	X	X	X	X	X	X	N	N	N	X	X	X	X	X	X	X	X	1	X	Recovered
124	Pavithran	1	M	311778	R	K	2	I	N	E	✓	✓	X	X	X	X	T	N	N	✓	X	X	X	3	2	13	X	2	X	Recovered
125	Maheshwari	2	F	311892	R	K	1	I	N	SCALP	✓	X	X	X	X	X	T	N	N	✓	X	X	X	3	2	14	X	2	X	Recovered
126	Deepak	2	M	311918	R	K	2	I	N	E	✓	✓	✓	✓	X	X	B	N	H	✓	X	X	X	2	2	11	X	2	✓	Recovered
127	Ilakiya	10	F	313991	R	K	1	I	N	E	✓	X	X	X	X	X	N	N	N	✓	X	X	X	1	4	26	X	2	X	Recovered
128	Atchaya	2	F	314293	R	K	2	O	D	E	✓	X	✓	✓	X	X	N	N	N	✓	X	X	X	2	2	12	X	2	X	Recovered
129	Sandhya	9	F	314752	R	P	3	I	D	EAR	✓	✓	X	X	X	X	T	N	N	✓	X	X	X	1.5	2	14	X	2	X	Recovered
130	Raman	11	M	315003	R	K	1	I	N	E	X	X	X	X	X	X	N	N	N	X	X	X	X	X	X	X	X	1	X	Recovered
131	Sathyabaran	7	M	315717	R	K	1	I	N	E	X	X	X	X	X	X	N	N	N	X	X	X	X	X	X	X	X	2	X	Recovered
132	Hariharan	2	M	315929	R	K	2	I	N	E	✓	X	X	X	X	X	N	N	N	X	X	X	X	X	X	X	X	1	X	Recovered
133	Giridaran	7	M	315934	R	P	3	I	N	E	✓	X	X	X	X	X	N	N	N	✓	X	X	X	1	1	4	X	1	X	Recovered
134	Buvana	2	F	316256	R	K	1	I	N	E	✓	✓	X	X	X	X	T	N	N	✓	X	X	X	3	2	13	X	2	X	Recovered
135	Hariharan	6	M	316296	U	P	3	O	D	E	X	X	X	X	X	X	N	N	N	✓	X	X	X	2	1	5	X	1	X	Recovered
136	Anand	4	M	316184	R	K	1	O	D	E	✓	✓	X	X	✓	X	N	N	N	✓	X	X	X	3	2	12	X	2	X	Recovered
137	Sivasankari	9	F	317159	R	K	1	I	N	E	✓	X	✓	✓	X	X	T	N	H	✓	X	X	X	4	2	14	X	2	X	Recovered
138	Vignesh	10	M	317362	U	P	3	O	D	E	X	X	X	X	X	X	N	N	N	✓	X	X	X	1	1	4	X	2	X	Recovered
139	Mohamedrizwan	4	M	317550	U	K	2	O	D	E	✓	✓	✓	✓	X	X	N	N	H	✓	X	X	X	2	1	5	X	2	X	Recovered
140	Srihari	3	M	317750	R	P	3	O	D	E	✓	X	X	X	X	X	N	N	N	✓	X	X	X	2	1	5	X	1	X	Recovered
141	Nandhini	8	F	317844	R	K	1	O	D	E	X	X	X	X	X	X	T	N	N	✓	X	X	X	7	3	22	X	3	X	Recovered